

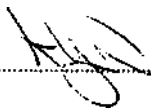
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Business Process Document

25 kV overhead line equipment insulators

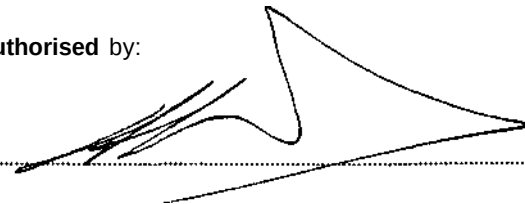
Endorsement & Authorisation

Endorsed by:



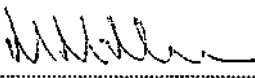
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2	February 2006	Re-issued as a SAF3 Business Process Document

Implementation

4 February 2006

Compliance

This Network Rail specification is mandatory and must be complied with by Network Rail and its contractors from 4 February 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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I Purpose

This specification states the requirements for the design, manufacture and testing of insulators for overhead line equipment used on 25 kV A.C. Electrified Lines.

The insulators included are those which either support live 25 kV a.c. conductor wires or return conductors, are used with tensioned conductors, or form part of isolators or other equipment associated with the overhead line.

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

2 Scope

This specification applies to all new insulators installed on A.C. Electrified Lines.

3 Reference documentation

NR/WI/ELP/27237	Work Instruction NR/OLE/CI2 Maintenance and cleaning of overhead line insulators
EN ISO 9001	Model for quality assurance in design, development, production, installation and servicing
EN 60507	Artificial pollution test
BS 12	Specification for Portland cement
BS 137	Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V
BS 60383	Tests on insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V
IEC 383	Composite insulators for a.c. overhead lines with a nominal voltage greater than 1000 V - Definitions, test methods and acceptance criteria
IEC 1109	Composite insulators for a.c. overhead lines with a nominal voltage greater than 1000 V - Definitions, test methods and acceptance criteria
BS 60168	Tests indoor and outdoor post insulators of ceramic material or glass
IEC 168	for overhead lines with a nominal voltage greater than 1000 V

4 Definitions

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

Allocation Design	The geographical allocation of the Basic Designs to an electrification project to meet the System Design and performance specification and thus allowing the production of a Bill of Quantity for all components and associated materials. The completed Allocation Design enables all materials to be identified, purchased, assembled as necessary and installed on the project, and determines the detailed records of construction for maintenance purposes.
Basic Design	Preparation of designs for overhead line equipment and traction power supplies based on the System Design, which record detailed technical illustrations, standards, specifications and dimensions of: general arrangements, assemblies, sub-assemblies and components. These Basic Designs are used for allocation, purchase, manufacturing, installation and commissioning of an electrification project and allow the subsequent maintenance requirements to be developed and implemented.
British Standard	A standard published by the British Standards Institution. Its alphanumeric identity is prefixed by BS.
Composite Insulator	An insulator comprising a polymeric core coated with an insulating material and fitted, where necessary, with metal end caps.
Insulators	Insulators 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.
Porcelain Insulator	An insulator comprising of a glazed porcelain core formed to a shedded profile and fitted where necessary with metal end caps.
Procurement Specification	The contract specific Railtrack documentation, such as, Invitation to Tender or Technical Worksopce.

Network Rail Business Process Standard	A collective term for a Network Rail Specification, Procedure or Guidance Note, published by a directorate of Network Rail.
OLE	Overhead Line Equipment
SCADA	Supervisory control and data acquisition.

5 Description of the a.c. traction system

The a.c. electrification traction supply system forms part of the railway infrastructure owned and operated by Railtrack. The system consists of feeder stations, track sectioning cabins/locations, a 25 kV overhead line contact system and associated SCADA systems.

Some lines are dual equipped with both a.c. and d.c. traction systems or are adjacent to other administrations' traction systems. Where appropriate further details are provided in the procurement specification.

5.1 The high voltage network

The power supply is obtained at 25 kV, single phase, from the Electricity Supply Industry at feeder stations spaced at intervals of about 40 km along the railway. These supplies may be derived from different phases and therefore may have a phase displacement of up to 120°.

Electrical feeding and isolation of the overhead line are effected by operation of circuit breakers and manual or motorised overhead line switches.

One pole of each 25 kV supply is connected to the running rails at the feeder stations and since the overhead line supporting structures are also connected to the running rails, this results in a multiple earth system having an overall resistance to earth of less than 1Ω.

Trains draw traction current from the overhead line contact system by means of a pantograph. The current is returned to the feeder station by way of the running rails and earth, or, where this would give rise to unacceptable inductive interference, by way of the running rails and return conductors which may also be equipped with booster transformers.

Due to the exposed nature of the a.c. electrification system, it is subject to frequent short circuits of varying severity. The maximum value of short circuit current will be stated, where applicable, in the procurement specification.

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The feeder stations and track sectioning cabins/locations are normally unmanned, the equipment being remotely controlled and monitored from electrical control rooms by means of the SCADA systems.

5.2 Service conditions

The 25 kV nominal supply voltage may vary, under normal conditions over the range 27.5 to 16.5 kV. Under certain abnormal conditions the voltage may rise to 29 kV for 5 minutes, or fall to 14.0 kV for 10 minutes or 12.5 kV for 2 minutes.

The 50 Hz nominal supply frequency may vary between $\pm 1\%$.

The overhead contact system is designed for good current collection at all train speeds but a limited degree of sparking does occur resulting in transient effects.

Harmonics are present in the 25 kV supply due to traction rectifiers and thyristors on the trains. Typical values of harmonics will be stated, where applicable, in the procurement specification.

6 General clauses

6.1 Safety, Legislation and Regulations etc.

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

The insulators shall comply with the requirements of all relevant statutory acts, rules, regulations or orders, including:

- a) Health and Safety at Work Act, 1974;
- b) Electricity at Work Regulations, 1989;
- c) Construction (Design and Management) Regulations, 1994;
- d) Railways (Safety Case) Regulations, 1994;
- e) Electromagnetic Compatibility (EMC) regulations;
- f) Control of Substances Hazardous to Health Regulations, 1988.

For substances falling within these regulations the supplier shall provide a risk assessment covering the life of the equipment and its eventual disposal. Materials containing asbestos, chlorinated fluorocarbons (CFCs) or polychlorinated biphenyl's, (PCBs) shall not be used.

- g) HMRI Railway Safety Principles and Guidance, including part 2 section C, Guidance on electric traction systems.