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Issue	2
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Business Process Document

Trackside pantograph monitoring equipment

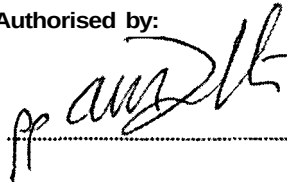
Endorsement & Authorisation

Endorsed by:



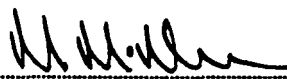
K. Lydford, Head of Electrification & Plant Engineering

Authorised by:



A. McNaughton, Chief Engineer

Accepted for issue by:



M. McManus, National Standards Manager

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Issue record

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2	April 2006	Re-issued as a SAF3 Business Process Document (<i>formerly RT/E/S/21072</i>)

Implementation

1 April 2006

Compliance

This Network Rail product specification is mandatory and must be complied with by Network Rail and its contractors from 1 April 2006

When this product 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 performance requirements for lineside train pantograph monitoring equipment to monitor pantograph dynamic performance on passing trains.

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

2 Scope

This specification applies to all new pantograph monitoring equipment installed on A.C. Electrified Lines.

3 Reference documentation

NR/SP/ELP/21073	Network Rail Business Process Document – The siting of pantograph monitoring equipment
NR/SP/ELP/21028	Network Rail Business Process Document – Specification for ancillary wiring of electrical distribution equipment
NR/GN/ELP/27233	Network Rail Business Process Document – Characteristics of railway traction power supplies
EN ISO 9001	Model for quality assurance in design, development, production, installation and servicing
EN 60439	Low-voltage switchgear and controlgear assemblies
EN 60529	Specification for degrees of protection provided by enclosures (IP code)
IEC 529	
BS 5378	Safety signs and colours
BS 88	Specification for cartridge fuses for voltages up to and including 1000 V a.c. and 1500 V d.c. General requirements

4 Definitions

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

Equipment	Equipment 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.

Monitoring Site	The location on the track-side where the pantograph is monitored.
Procurement Specification	The contract specific Network Rail documentation, such as, Invitation to Tender or Technical Work Scope.
OLE	Overhead line equipment.
MTBF	Mean time between failures.
UPS	Un-interruptible power supply.
RRL	Remote reporting location.
GUI	Graphical user interface.
SCADA	Supervisory control and data acquisition.

5 Description of the a.c. traction system

The a.c traction power supply system is described in [NR/GN/ELP/27233](#), with the following addition. Where appropriate further details are provided in the procurement specification.

5.1 Pantograph operation

Train pantographs are maintained regularly in depots to ensure that the carbon contact strips are in good condition, that wear on joints is not excessive, that aerofoils are set at the correct angle and that the upward force is within prescribed limits.

However these are static measurements and do not measure the performance of the pantograph when in operation at speed.

Experience has shown that the overall condition of a pantograph can be determined by measuring the movement it induces in the overhead wires when passing a measuring location at speed.

Consequently equipment which records this wire movement (uplift) as a train passes can be used to determine the pantograph performance. Several factors affect the uplift of the wire:

- pantograph type and position/orientation;
- train speed;
- wind speed and direction;
- type of overhead line equipment and wire tension.

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For any given site the type and parameters of Overhead Line Equipment are known. The other variable factors need to be determined for each passing pantograph. It is important to measure these at the instant of pantograph passage so that their effects can be judged accurately. If the data is then fed into a database it can be analysed and conclusions about the condition of an individual pantograph can be made.

6 General clauses

6.1 Safety, Legislation and Regulations etc

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 apparatus 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 equipment 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 biphenyls, (PCBs) shall not be used.

This information is not necessarily exhaustive and does not modify the legal obligations of the supplier.

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

6.2 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.

The supplier shall provide a safety case for equipment with novel or innovative features not previously used within the railway environment. The safety case shall quantify any additional risks and indicate how these risks are controlled.

6.3 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 stated in the procurement specification. 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 including the l.v. supply;
- b) operating instructions, including safety and isolation procedures;
- c) routine maintenance including any special precautions, fault finding and major overhaul procedures and periodicity;
- d) full details of recommended adjustments and settings for the equipment and its protective devices where appropriate;
- e) instructions for eventual disposal including safety and handling precautions and recommendations;
- f) drawings, illustrations and data enabling all component parts to be readily identified and to allow procurement for replacement purposes;
- g) the drawings listed in clause entitled 'Drawings';
- h) 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.

Three copies of the draft manual shall be submitted to the purchaser not later than the end of the third quarter of the period between the contract date and scheduled delivery date and in sufficient time to enable any modifications to be incorporated and the full quantity of final copies to be available prior to delivery of the equipment.