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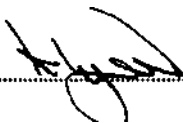
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Business Process Document

Product Specification for Uninterruptible Power Supplies (UPS)

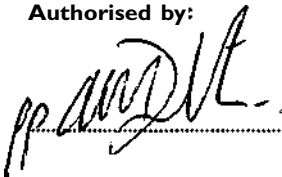
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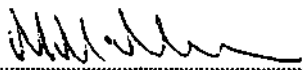
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Issue record

Issue	Date	Comments
3	October 2005	Re-issued as a SAF3 Business Process Document

Implementation

1 October 2005

Compliance

This Network Rail Specification is mandatory and must be complied with by Network Rail/Contractors from 1 October 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 Purpose

This product specification states the requirements for Uninterruptible Power Supply (UPS) units when installed to provide power for Network Rail's operational infrastructure.

2 Scope

This product specification states the requirements for the design, manufacture, testing at both supplier premises and at site, delivery and commissioning of the UPS, together with the preparation and supply of associated documentation, drawings and manuals.

The UPS equipment described within this document may be classified according to the following four load categories:

- a) above 10kVA which include a signalling component;
- b) above 10kVA which do not include a signalling component;
- c) up to and including 10kVA which include a signalling component;
- d) up to and including 10kVA which do not include a signalling component.

Examples of these categories are shown in Appendix A.

Unless stated otherwise within the document, each clause applies to UPS equipment supplying all four load categories listed above.

The supplier shall provide a UPS suitable for signalling applications unless specifically stated otherwise by the customer.

The specification describes equipment intended for installation within buildings but not lineside apparatus cases.

Sample data sheets for UPS equipment have been produced which show the level of detail required to specify the equipment and concisely lists all of the options. The data sheets are shown in Appendix B.

UPS equipment installed for signalling applications require assessment through the Product Acceptance Process ([RT/LS/P/029](#)). The requirements that need to be fulfilled in order to meet the technical aspect of the acceptance are listed in Appendix C.

3 General Requirements

The UPS shall provide the required continuity and quality of supply to the load when both an incoming supply and/or alternative supply is present, and for a predetermined time following their failure, throughout its service life.

3.1 Safety, Legislation, Regulations and Recommendations

- 3.1.1 At all times the UPS shall be safe. All appropriate measures shall be taken to ensure the safety of persons concerned in its installation, operation, maintenance, repair and eventual disposal. All equipment necessary for the safe and satisfactory operation, control and protection of the UPS shall be chosen appropriately.
- 3.1.2 The UPS shall be adequately provided with facilities for both external and internal interlocking, padlocking, earthing, insulating, screening and enclosing. Safe and appropriate access shall be provided for both operation and maintenance purposes.
- 3.1.2 The UPS shall comply with the requirements of all relevant Statutory Instruments, Regulations and Orders, and take cognisance of relevant documents, including, but not limited to:
- a) The Health and Safety at Work etc. Act 1974;
 - b) The Electricity at Work Regulations 1989;
 - c) The Railways (Safety Case) Regulations 1994;
 - d) Electromagnetic Compatibility (EMC) Directive;
 - e) The Control of Substances Hazardous to Health Regulations (COSHH) 1999;
 - f) The Manual Handling Operations Regulations 1992.

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

- 3.1.4 The supplier shall provide recommendations for training for all aspects associated with the operation and maintenance of the UPS.
- 3.1.5 For all materials used both in the construction of the UPS and for subsequent maintenance purposes, and which are considered as falling within the scope of the COSHH Regulations 1999, the supplier shall provide a risk assessment report for these materials for the life of the equipment and its eventual disposal.

3.2 Design, Manufacture and Workmanship

- 3.2.1 The UPS shall be designed and manufactured in accordance with best available techniques not entailing excessive cost, and taking cognisance of the environment in which it will operate.
- 3.2.2 All material shall be new, of current manufacture, and shall not have been in prior service except as required during testing, and be of the quality and type most suitable for working under the conditions specified for the service life of the UPS.

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3.2.3 Where specified by the customer, the supplier shall provide a safety case statement for equipment with novel or innovative features not previously used within the railway environment. The safety case statement shall quantify any risks and indicate how these risks are controlled.

3.2.4 For signalling applications, the manufacturer must maintain a copy of reference drawings which detail the design and construction of the equipment and against which any change must be identified in order to maintain configuration control. The reference drawings will be those used during the product acceptance process.

3.3 Spare Parts and Consumable items

3.3.1 The supplier shall make recommendations to Network Rail for holdings of spare parts and consumable items, based on estimated replacement rates and delivery periods, to ensure that the UPS complies with the requirements of this Product Specification throughout its service life.

3.3.2 The supplier shall indicate, where possible, the extent of commonality with equipment previously supplied to Network Rail.

3.4 Documentation

3.4.1 The supplier shall prepare and supply comprehensive and specific UPS documentation, drawings and manuals, in the required format, covering all aspects of safe handling, operation, maintenance, storage and eventual disposal. As a minimum, two copies of all associated documentation shall be provided.

3.4.2 The manual must recommend when or under what circumstance components such as electrolytic capacitors and fans must be changed so as to achieve the service life of the UPS.

3.4.3 Details of any fuse protection installed in the a.c.. power circuits shall be provided.

3.5 Delivery

3.5.1 The UPS shall be suitably prepared to withstand, without any damage or deterioration, handling, transit, storage and positioning. If required, the UPS shall be suitably protected against external climatic conditions for an indefinite storage period.

3.5.2 Any factor which may affect the onward delivery of the UPS to a final site (e.g. dimensions and weight limits) shall be subject to agreement between the supplier and Network Rail.

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3.6 Compliance with Standards

- 3.6.1 All work associated with the UPS shall comply with all relevant parts of European Standards, whether reference is made to them or otherwise, within the text of this Product Specification.
- 3.6.2 In the absence of relevant European Standards, International or National Standards having currency within the European Community shall apply subject to the prior agreement of Network Rail.
- 3.6.3 The UPS shall be designed, manufactured and tested in accordance with this Product Specification, and the relevant parts of BS EN 62040. Evidence shall be provided that these tests have been completed.
- 3.6.4 All equipment must comply with BS EN 50091-2 and BS EN 61000-6-2.
- 3.6.5 Equipment for signalling applications shall comply with the requirements of BS EN 50121-5.
- 3.6.6 Where specified by the customer, compliance with BS EN 50121-4 will be required.

3.7 Reliability and Availability

- 3.7.1 For each single module of the UPS, excluding the battery system, the Mean Time Between Failure, relative to continuous operation, shall be equal to or greater than the following:
 - Signalling Applications 175,000 Hours
 - Non-Signalling Applications 80,000 Hours
- 3.7.2 For signalling applications a fault tree analysis using relevant MIL standards or an equivalent alternative approach may be used to demonstrate achievement of this requirement.
- 3.7.3 For UPS equipment with innovative features, or where insufficient historical data is available, the supplier shall state the methods used to determine reliability performance.
- 3.7.4 Where UPS continuous operation is required, either partial (N+1) redundancy or 100% redundancy may be employed. Whichever system is selected the supplier shall adequately demonstrate the ability of the system to operate continuously.

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3.8 Interchangeability and Standardisation

- 3.8.1 As far as reasonably practicable, UPS equipment shall be of a standard product type and utilise components, which have replacement availability for a minimum period of 5 years after the obsolescence of the UPS.

3.9 Service Life

- 3.9.1 UPS equipment which has been maintained in accordance with the manufacturer's instructions, excluding the battery system and other consumable items, shall be capable of performing its intended function, whilst meeting its reliability target, for a service life of a minimum period of 15 years unless the unit is rated less than 10 kVA and not utilised for signalling applications in which case a service life of 10 years may be specified.

3.10 Labels and Marking

- 3.10.1 Adequate safety and warning labels complying with BS 5499 shall be provided and shall be suitably secured for the service life of the UPS.
- 3.10.2 Where the UPS cannot be lifted by one man in accordance with the Manual Handling Regulations, the unit shall be clearly and indelibly marked with its gross weight in kilograms, centre of gravity and handling and lifting points.

3.11 Locks and Keys

- 3.11.1 Where mechanical locking facilities are present, locks shall be provided with a minimum of 2 sets of keys. Additional keys shall be available from the supplier for a minimum period of 5 years after the obsolescence of the UPS.

3.12 Security of Isolation

- 3.12.1 Where electrical devices are used as an isolating function, provision shall be included to ensure that these remain in the locked off position.

4 Performance Requirements

4.1 Operation

- 4.1.1 The UPS shall be of the solid-state, no-break type between all operating modes, and shall utilise microprocessor control and monitoring functions.

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- 4.1.2 The UPS shall be able to continuously withstand a reversal of either the incoming or alternative supply without incurring permanent damage.
- 4.1.3 The UPS shall include a system for providing bypass facilities to allow automatic changeover upon failure of either the incoming, alternative or battery system supply unless the unit is designed to include multiple parallel redundant UPS equipment which combine to provide a fault capability greater than that of the load protection requirements. The Network Rail Engineer must approve the use of multiple parallel redundant UPS equipments. Where parallel redundant UPS equipments are provided without an automatic bypass facility then the phase fault and earth fault capabilities must be agreed.
- 4.1.4 The UPS shall be compatible with the distribution system. The distribution system may be earthed or unearthed.
- 4.1.5 The UPS output shall be free of earth when directly connected to signalling equipment requiring an unearthed supply.
- 4.1.6 A single phase failure on the output of a three phase UPS shall cause the output to transfer to bypass operation.
- 4.1.7 The UPS may be supplied from a local distribution supply, a diesel generator or a 25kV derived traction supply. For additional details of UPS applications on Network Rail Infrastructure please see [RT/E/G00011](#) "UPS Equipment".
- 4.1.8 Where a UPS supplies an SSI installation the following requirements for harmonic voltage monitoring shall apply. These requirements may be specified for other types of processor based signalling systems at the discretion of the Signal Engineer.

In the event of either a converter overload exceeding the requirements of Clause 4.7.3, or a converter failure condition, or, the failure of any other component, excluding the bypass system, which will render the inverter unable to meet the requirements stated in Clause 4.4.1, providing that the bypass system is within its required operating limits, the load shall be applied to the bypass system to maintain the required output supply parameters.

In addition to switching to bypass, the UPS shall alarm in the event of any of its operating mode outputs exceeding the requirements stated in Clause 4.4.1.

This function shall be achieved either by a device independent of the UPS or by monitoring equipment which is separate from the normal control and operation functions of the unit.