

Letter of instruction

Information for users

The following document:

NR/SP/ELP/21060 Issue 2

has had changes made to it, most recently, with effect from **24 January 2013**.

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.

NR/BS/LI/281	Issue 1	24 January 2013	Proceed to letter ►
NR/SP/ELP/21060	Issue 2	04 February 2006	Proceed to standard ►

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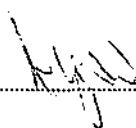
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Business Process Document

Issue of safety documentation for work on
650/750 V d.c. apparatus

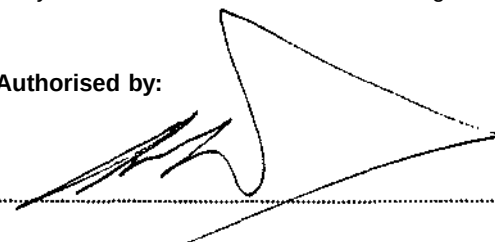
Endorsement & Authorisation

Endorsed by:



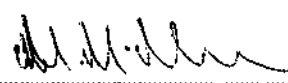
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Issue record

Issue	Date	Comments
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).

Disclaimer

In issuing this document for its stated purpose, Network Rail makes no warranties, express or implied, that compliance with all or any documents it issues is sufficient on its own to ensure safe systems of work or operation. Users are reminded of their own duties under health and safety legislation.

Supply

Copies of documents are available electronically, within Network Rail's organisation. Hard copies of this document will be available to Network Rail employees on request to the document controller and to other organisations from IHS Technical Indexes (01344 404409)

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1 Purpose

To prevent injury or danger to persons working on or near 650/750 V d.c. apparatus.

2 Scope

This Specification applies to all 650/750 V d.c. apparatus at substations, track paralleling huts and other lineside locations forming part of traction power distribution systems. In particular, this Specification shall apply to the secondary side of rectifier transformers, rectifiers and their connections, busbars, d.c. switchgear and its connections and, where they can be isolated from the conductor rail, track feeder cables and trackside current and voltage relays.

Conductor rails and electric track equipment covered by the appropriate D.C. Electrified Lines Working Instructions are specifically excluded from the scope of this instruction.

In the Merseyrail area Nominated Persons carry out the duties of Authorised Persons where required by this document.

Testing involving high current or non-routine tests using 650/750 V d.c. traction power sources shall be specially authorised and documented and is outside the scope of this Specification.

3 Reference documentation and safety documents

GO/RT/3091	D.C. Electrified Lines Instructions
NR/SP/ELP/21067	Instructions for the making out, issuing and cancellation of Permits to Work, Sanctions for Test and Circuit State Certificates
NR/WI/ELP/27115	Arrangements for Isolation of the Conductor Rail for Pre-Planned Possessions of the Line.
EN 60529	Degrees of protection provided by enclosures (IP Code)

4 Definitions

Where appropriate definitions have been used from [GO/RT/3091](#), the 'D.C. Electrified Lines Instructions.'

Basic Electrical Clearance	A clearance of sufficient magnitude between an exposed live conductor and any other conductor which ensures that electrical flashover does not occur.
British Standard	A Standard published by the British Standards Institution. Its alphanumeric identity is prefixed by BS.

Danger	Risk of injury. Refer to Electricity at Work Regulations, 1989.
Danger Notice	A notice with wording including the heading “Danger” and drawing attention to the fact that the apparatus is alive and/or that it is dangerous to approach or interfere with it.
Electrical Control Operator	The person in charge of the Electrical Control Room, having control of the power supply to the electric traction system and who is responsible for all switching operations and isolations of electrical equipment thereon.
Electrical Safety Clearance	That clearance from an exposed live conductor which shall not be infringed by any part of a person or tool or material being used by a person other than under live working conditions.
Equipment	Equipment including all component parts and accessories.
European Standard	A Standard published 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.
Isolated	Electrical equipment is isolated when it is disconnected from all sources of electricity supply.
Key Safe	A device of an approved type for the secure retention of keys.
Live Working Zone	A zone immediately adjacent to and within the defined Electrical Safety Clearance from an exposed live conductor within which it is dangerous to work or allow non insulated tools or materials to be used.
Network Rail Line Standard	A collective term for a Network Rail Line Specification, Network Rail Line Procedure or Network Rail Guidance Document, published by a directorate of Network Rail.
Reasonably Practicable	For full explanation refer to Electricity at Work Regulations, 1989.

Restricted Working Zone	A zone outside the defined Electrical Safety Clearance but within the defined Safe Working Clearance where special care is required to avoid danger.
Safe Working Clearance	That clearance from an exposed live conductor outside of which no danger will normally arise.
Safe Working Zone	A zone outside the defined Safe Working Clearance from an exposed live conductor where no special care is required to avoid danger.
Switching off	Cutting off the supply
Unreasonable	For full explanation refer to Regulation 14 of the Electricity at Work Regulations, 1989.
Working Party	A competent person working alone or a group of persons working under the supervision of a competent person.
SCADA	Supervisory control and data acquisition.
ECO	Electrical Control Operator

5 Principles

Before any work is carried out on apparatus which can be made alive at 650/750 V d.c., the apparatus shall be switched off, isolated, and a Certificate of Isolation issued to the person carrying out the work.

By exception, where it is unreasonable to make the apparatus dead and Electrical Safety Clearances between the person and exposed live conductors cannot be achieved, work shall be carried out only after an assessment of the need to maintain the conductors in a live state has been made. Risk assessments and method statements shall be prepared and shall detail any special precautions required. (See the section titled 'Live Working').

6 General clauses

6.1 Security of isolation

Where use is made of fuses, switches, miniature circuit breakers etc. as a point of isolation, precautions shall be taken to ensure that the isolation remains secure while work is performed.

6.2 Access to electrical equipment

Persons working on 650/750 V d.c. equipment shall be trained and hold valid certification to undertake the tasks required.

7 General requirements when creating an isolation

7.1 Switching off

The apparatus to be worked on shall be switched off by the opening of circuit breakers or other appropriate devices.

7.2 Isolation

The apparatus shall be isolated by opening of isolators or switches, withdrawal of links/fuses or withdrawal of circuit breakers, as appropriate.

7.3 Securing the isolation

Where practicable, the isolation shall be secured by locking of operating handles, shutters or other means, to prevent inadvertent restoration of the power supply.

Where locks are used to secure the isolation, the relevant keys shall be given to and retained by the person in charge of the working party together with the Certificate of Isolation.

Where more than one working party is working under the protection of a given isolation, key safes or similar devices shall be used to enable each person in charge of a working party to be issued with a unique key together with a Certificate of Isolation

7.4 Proving the apparatus is dead

The apparatus, having been isolated from all sources of supply, shall be tested with an approved voltage testing device to prove that it is safe to work upon.

Where practicable, the testing device shall be proved immediately before and after the test on the isolated apparatus, by application to equipment which is known to be live. Alternatively, when the testing device is equipped with a self-test facility, this facility may be used instead.

7.5 Danger notices

“Danger - Not to be Operated” Notices of an approved type shall be affixed conspicuously at all points of isolation, warning of the danger of interference with the isolation.

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Where other apparatus remains in service in close proximity to the work area, “Danger - Alive” Notices of an approved type shall be affixed conspicuously to or close to the apparatus remaining in service, warning of the danger of coming into contact with live equipment.

7.6 Certificates of isolation

A Certificate of Isolation shall be made out for each working party, which describes the apparatus upon which it is safe to work, the limits of the work area, the points of isolation and the work to be carried out.

7.7 Issue of multiple certificates of isolation

A common point of isolation may be used in support of two or more Certificates of Isolation for different working parties. The device used as the point of isolation shall not be restored to the normal or closed position until all relevant Certificates of Isolation have been cancelled.

Where more than one working party is to undertake work, multiple Certificates of Isolation shall only be issued by a single Level A person. A record shall be made on all such certificates of the unique numbers of any other certificates issued under that isolation. Multiple certificates shall only be issued where the isolation may be secured in accordance with the clause entitled ‘Securing the Isolation.’

7.8 Advice to electrical control operator

Where systems are under the control of an ECO, the ECO shall be kept advised of all relevant actions in connection with the isolation and of any safety documentation issued.

8 Typical applications

Guidance on specific requirements for the isolation of typical items of 650/750 V d.c. apparatus is set out in Appendix A.

9 Safety clearances

9.1 Electrical safety clearance

The minimum Electrical Safety Clearance to be maintained between any exposed live conductor and any part of a person or non-insulated tool or materials being used by a person carrying out work is 350 mm. Any work carried out where this minimum clearance cannot be achieved shall be carried out in accordance with the clause entitled ‘Live Working Conditions.’

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9.2 Safety working clearance

Suitable Safety Working Clearance shall be maintained between any exposed live conductor and any part of a person or non-insulated tool or materials being used by a person carrying out work under a Certificate of Isolation.

Guidance on the application of Safety Working Clearances is given in Appendix B.

10 Working zones

10.1 Restricted working zone

The Restricted Working Zone is the area outside the Live Working Zone but where it is impossible to achieve the Safety Working Clearances as set out in Appendix 'B' of this specification.

Access to a Restricted Working Zone shall only be by a person certified as competent to access such Zones.

The extent of the Restricted Working Zone shall be clearly delineated.

10.2 Safe working zone

The Safe Working Zone is the area outside the Restricted Working Zone where it is possible to achieve the Safety Working Clearances as set out in Appendix 'B' of this specification.

11 Physical and insulating barriers

11.1 General

Any live equipment still in service which may become a source of danger to the persons carrying out the work shall be covered with an insulating shroud as described in the section below. Where this is not practicable, a barrier or screen shall be erected so as to prevent members of the working party approaching or coming into contact with live conductors.

11.2 Shroud

A shroud is a purpose built cover, constructed of an approved insulating material, designed to completely enclose an exposed live conductor such that there is no risk of personal contact with the exposed live conductor.

Exposed live conductors may be covered by shrouds to achieve a Safe Working Zone.

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11.3 Barrier

A barrier is a permanent or temporary obstacle designed to prevent approach to exposed live conductors.

The barrier may be in the form of a rope and flags, coloured tape or plastic fencing and shall be erected such that it is normally no closer to the exposed live conductor than the Safety Working Clearance for Safe Working or no closer than the Electrical Safety Clearance for Restricted Working.

A barrier may be used to create a Safe Working area or a Restricted Working Area around exposed live conductors.

11.4 Screen

A screen is a permanent or temporary obstacle erected between the work position and the exposed live conductors, such that the taut-string distance around the screen between the work position and the exposed live conductors is not less than the appropriate Safety Working Clearance for Safe Working or not less than the Electrical Safety Clearance of 350 mm for Restricted Working

A screen may be constructed from either conducting or non-conducting material in the form of a solid sheet or a close mesh.

Construction in the form of a solid sheet shall conform to the requirements of [EN 60529](#), code IP2X. Construction in the form of a mesh shall conform to the requirements of [EN 60529](#), code IP1X.

If constructed of an approved insulating material, in the form of a solid sheet, the screen may be in contact with or fixed to the exposed live conductor, however the appropriate Safety Clearance shall be observed at all times by the person erecting the screen.

If constructed of an approved insulating material, in the form of a mesh, the screen shall not be closer than the Electrical Safety Clearance of 350 mm to the exposed live conductor, however the appropriate Safety Clearance shall be observed at all times by the person erecting the screen.

A screen may be used to achieve a Safe Working Zone around exposed live conductors.

If constructed of a metal non-insulating material, the screen shall be securely fixed and also connected to the traction earth or to traction negative as appropriate. If constructed in the form of a solid sheet, the screen shall not be closer to the exposed live conductors than 100 mm, or if constructed in the form of a mesh, the screen shall not be closer than the Electrical Safety Clearance of 350 mm.