Letter of instruction

Information for users

The following document: NR/WI/ELP/27051 Issue 4 has had changes made to it, most recently, with effect from 16 December 2014.

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/074	Issue 1	25 October 2007	Proceed to letter ▶
NR/BS/LI/096	Issue 1	04 June 2008	Proceed to letter ▶
NR/BS/LI/099	Issue 1	18 August 2008	Proceed to letter ▶
NR/BS/LI/346	Issue 1	16 December 2014	Proceed to letter ▶
NR/WI/ELP/27051	Issue 4	02 June 2007	Proceed to standard ▶

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Ref	NR/WI/ELP/27051
Issue	4
Date	June 2007

Work Instruction

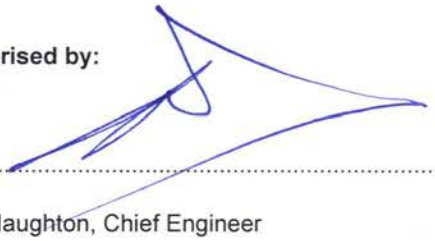
Work Instructions for D.C. Electrified Lines in the Liverpool area

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

Issue	Date	Comments
4	June 2007	Section F amended to include a new section 21 – Track Circuit Failure in a Single Bore Tunnel.

Implementation

June 2007

Compliance

This Network Rail work instruction is mandatory and shall be complied with by Network Rail and its contractors from June 2007

When this work instruction 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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Section A - Definition of terms applying to the instructions or in general use

Alive	Charged with electricity.
Bond	An electrical connection in the conductor rail, running rail traction return circuit or in a signalling track circuit.
Continuity bond (Traction)	A bond across the gap in the traction return rails at points and crossings.
Cross bond (Traction)	A bond between the traction return rails of the same or adjacent tracks.
Expansion gap bond	A flexible bond across a gap between two lengths of welded conductor rails.
Impedance bond	A device which, whilst allowing the traction return current to flow freely, so impedes the flow of track circuit current as to isolate two track circuits one from another.
Rail joint bond	A bond across the joint between two running rails.
Transposition bond (Traction)	A bond to connect two traction return current rails where the traction return current rail changes from one side of the track to another.
Brake controller (Applies to units 977346, 348 and 350)	A device in the cab of an electric train by which the power brake is controlled. When not in use it is isolated by a key or cock. The power braking of the electric train consists of an electro-pneumatic (e.g.), brake and an automatic continuous brake.
Brake switch (Applies to Class 507 & 508 E.M.Us)	A device in the driving cab by which the power brake is controlled. Power braking consists of "Westcode" electrically controlled air operated disc brakes and is used throughout the train. In addition, electro-dynamic (rheostatic) power braking and spring applied parking brakes are provided in each motor coach.
CSR	Cab secure Radio or Merseyrail Comprehensive Radio System.
Changeover switch	A track switch which is connected in such a way that a sub-section can be fed from one of two possible supplies. It shall not be used as a section isolator.

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Circuit

An arrangement of conductors and electrical apparatus connected to a source of electricity supply.

Open circuit

The condition applying when a circuit is incomplete as by the opening of a switch or by the omission of a connection in the circuit, thus preventing electric current from flowing.

Short circuit

A connection between positive and negative which permits excessive current to flow in a circuit when alive.

Track circuit

An electrical circuit through the running rails which gives indication of track clearance for signalling purposes

Circuit breaker

A switch arranged to open automatically when a current above a pre-determined value flows through it.

Coasting board

A white diamond sign, mounted on a pole, positioned at the side of the line.

Collector Shoe

A device fixed to electric trains which bears on top of the conductor rail and collects the traction current.

Conductor

A substance which permits the flow of electricity.

Conductor rail

A rail through which electricity flows at a nominal 750 volts d.c. from the source of supply to electric trains. This is laid on insulators and fixed alongside the running rails.

Continuity bond

See Bond

Cross bond

See Bond

Current

The flow of electricity.

Traction current

The electrical current which is collected by the electric trains to power the traction motors.

Dead

Electrical equipment is said to be dead when it is disconnected from any source of electricity supply.

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Driving trailer coach — A coach of an electrical train having a driving cab but no traction motors or batteries. (Departmental units 977346, 348 & 350).

Earth — The general mass of earth and any conductor electrically connected to it.

Earthed — The term "earthed" when applied to conductor rail equipment, which is normally alive, means connected to the traction current return running rail.

Electrical control room — Part of Merseyrail I.E.C.C. which contains apparatus for the control of the circuit breakers in the sub-stations associated with the electric traction system.

Electrical control operator — The person in the Electrical Control Room, who has 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 Equipment — Any apparatus which is used for the generation, transmission, control or utilisation of electricity.

Electrical multiple unit — Two or more vehicles coupled together and not normally uncoupled in service, having a driving cab at each end and including one or two motor coaches.

Electric train — One or two multiple units coupled together to form one train and controlled from one driving cab.

Expansion gap bond — See Bond.

Feeder — A transmission line or cable in the electrical power distribution systems for.-

(a) bringing a supply of electricity to a sub-station and between sub-stations.

(b) connecting a sub-station to the conductor and running rails.

Feeder station — A building or compound containing electrical switch-gear and equipment to which main supplies from the Electricity Generating Industry are brought and from which the sub-stations are fed.

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Fire break An open space separating combustible materials which is capable of restricting the spread of fire. In the case of cable routes, this is the ground under or around which vegetation is regularly cleared and not allowed to grow.

Gapped An electric train is said to be gapped when all collector shoes are clear of the conductor rail.

Guard boarding Protective boarding placed alongside one, or both sides, of the conductor rail at certain locations.

Impedance bond See Bond

Insulation Material which offers extremely high resistance to the passage of electricity.

Insulator A component constructed of insulation material to separate the live parts of the circuit from each other or from earth.

Inverter An electrical device which when fed with a d.c. supply gives an ac. supply at the output terminals.

Isolated Electrical equipment is isolated when it is disconnected from any source of electricity supply.

Isolation forms Forms AE, AS, B and C used in connection with the isolation of the conductor rail.

Isolation instructions Instructions concerning electrical switching, limits of working and limits of isolations, which are kept at Electrical Control Rooms, depots and signal boxes.

Jumper An insulated electric cable connecting two points in an electrical circuit.

Train jumper

A flexible insulated cable connecting the circuits of one vehicle to the circuits of another.

Link line The lines from Brunswick exclusive to Sandhills exclusive including the Stock Interchange/Holding line between Paradise Junction and James Street.

Live See Alive.

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Loop line	The lines from Mann Island Junction to James Street via Lime Street Deep Level.
Master key	A key for unlocking the master switch to determine the direction of travel of an electric train.
Master switch	A four-position switch to determine the direction of travel.
Mersey Section	The lines from James Street to Rock Ferry (signals ML 719 and L 722) and Birkenhead Park.
Motor coach	A coach of an electric train on which the traction motors are mounted.
Negative	After passing through the equipment, the electricity returns to the source of supply through a conductor, said to have a negative polarity.
Nominated person	An authorised person who has been appointed in writing by, or on behalf of, Network Rail to issue and cancel "Permits to Work" for particular equipment.
Open circuit	See Circuit
Overhead auxiliary supply jumper	A flexible insulated cable attached to the overhead conductor rail and which can be plugged into an electric multiple unit to power the auxiliary equipment for maintenance purposes.
Overhead trolley traction jumper	A flexible insulated cable attached to a trolley running on an overhead conductor rail and which can be plugged into an electric multiple unit to enable it to be moved.
Paddle	An insulated device for lifting a collector shoe clear of the conductor rail, or for applying or removing a short circuiting bar.
Parallel	A method of connecting traction motors together which, by varying the value of starting resistance, allows full line voltage to be applied to the traction motors and enables the unit to accelerate to its maximum speed.

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Permit to work	A form of authority signed and issued by a Nominated Person to a PC/COSS or PICOP to be carried out on, or near to, conductor rail equipment. The purpose of the form is to make known to the person in charge of the work, exactly which equipment is isolated and earthed and upon which, or near to which, it is safe for the work to commence.
Polarity	See Positive or Negative
Positive	A conductor through which electricity flows from the source of supply to the electrical equipment is said to have positive polarity.
Power controller	A device operated by the Driver in a driving cab of an electric train which controls the traction motors.
Power line	An electric conductor at 750 V d.c. running through a section of a train to supply heating equipment.
Rail joint bond	See Bond
Rectifier	Static apparatus for the conversion of alternating current into direct current.
Section	A length of conductor rail which can be isolated electrically.
Section gap	The point where one section of conductor rail ends and the next one commences. The two sections are normally electrically connected to each other through a track isolating switch or through circuit breakers at a substation.
Series	A method of connecting traction motors together which, by varying the value of starting resistance, allows half line voltage to be applied to the traction motors and enables the unit to accelerate to approximately half speed.
Short circuit	See Circuit.
Short circuiting bar	A metal bar for emergency use which, when applied between the conductor rail and the running rail, cuts off the electrical current. When applied this forms an obstruction to all trains.
Short circuiting device	An appliance for electrically connecting the conductor rail to the running rail to prevent the conductor rail being accidentally made live during a current isolation. When applied, the running rails are left clear for the passage of non-electric trains.

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Substation	A building or compound containing electrical switch-gear and for other purposes.
Supervisory control	An electrical system for the remote control of equipment at unattended substations
Switch	A device for opening or closing an electrical circuit.
Track isolating switch	A switch normally located alongside the track which enables a section of conductor rail to be isolated.
T.E.C. tool	A rod applied by hand to the T.E.C. wires to obtain an emergency isolation of the conductor rail.
Track isolating switch	See Switch.
Trailer coach	A coach of an electric train which has neither traction motors nor driving cab.
Train jumper	See Jumper.
Train stop	A device fixed on the track, working in conjunction with a stop signal, for the purpose of applying the brake in the event of a train passing the signal at Danger.
Transformer	Static apparatus for supplying an alternating current at one voltage when fed with alternating current at a different voltage.
Transposition bond	See Bond.
Trip cock	A device fixed on the train which, when operated by the train stop, applies the brake.
Tunnel emergency communication (T.E.C.) system	A pair of wires attached to the tunnel wall to which train driving cab equipment can be connected for the purpose of effecting an emergency isolation of the conductor rail and/or telephone communication with the signal box or Electrical Control Room.
Wirral Section	The lines from Birkenhead Park to West Kirby and New Brighton.

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Section B - Description of the system

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1 The system

The d.c. electrified lines in the Liverpool Area are electrified by a conductor rail system which consists of a conductor rail located on the sleeper ends in the cess or six foot way. One, or sometimes both of the running rails are electrically bonded across the joints and act as a conductor for the return current.

Electricity is supplied by the Electricity Supply Authority to a feeder station as three-phase alternating current (a.c.) at 33,000 volts. From this feeder station it is distributed through high voltage cables to sub-stations situated at intervals alongside the electrified lines.

At the sub-stations, transformers and rectifiers convert the supply from alternating current (a.c.) to direct current (d.c.) at a nominal 750 volts for connection to the conductor rail system from which it is picked up by collector shoes on each train. After passing through the motors and equipment on the train it returns through the axles and wheels to the running rails and thence to the sub-stations.

The feeder stations and sub-stations are unattended and are kept closed and locked. The a.c. and d.c. switchgear in these buildings is remotely operated from Sandhills Electrical Control Room by means of supervisory control equipment.

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1 General rules and regulations applicable

All Rules and Regulations concerning the working of trains apply also to d.c. electric trains except as otherwise provided for in these Working Instructions.

2 Understanding of Instructions

2.1 Persons in charge in all departments are responsible for seeing that all staff under their supervision working d.c. electric trains or working on, or in the vicinity of, electrified lines equipped with conductor rails, have a copy of these instructions, with the exception of Trainmen working other than d.c. electric trains, who shall observe the instructions in the Sectional Appendix.

2.2 Persons in charge shall also satisfy themselves that each person concerned:

(a) understands which of the instructions apply to them and that they shall make themselves acquainted with, and will be held responsible for, the observance of all such instructions.

(b) fully understands the instructions relating to their personal safety.

In addition, when necessary, the Person in charge of a yard or siding(s) is responsible for drawing the attention of non-railway staff to the presence of nearby conductor rail equipment and the dangers associated with it.

2.3 All departments are responsible for seeing that contractors and other persons carrying out work under their control know and understand the instructions that apply to them. When necessary arrangements shall be made for the conductor rail equipment to be isolated and earthed in accordance with the instructions for the isolation of conductor rails.

3 Conductor rail always to be assumed alive

It shall be assumed that the conductor rail and connections are always alive, and even if it be known that electricity is switched off, it shall he understood that it could be switched on at any moment unless special provision has been made in accordance with Section D. Although the traction return current flows through the running rails it is not dangerous to human life.

4 Dangerous to touch conductor rail

The conductor rail is charged with electricity it 750 volts direct current and it is dangerous to step upon, touch or to come into contact with either the conductor rails or their connections. In addition staff shall not be step upon conductor rail guard boarding.

On no account shall a broken or displaced conductor rail be touched until it has been isolated.

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Special care shall always be taken when working close to conductor rails.

5 Dangerous to touch collector shoes

Collector shoes are connected together by cables and whether in contact with the conductor rail or not, shall be considered alive and dangerous to touch.

6 Dangerous to pour water onto conductor rail

It is dangerous to pour water, onto, or in the immediate vicinity of the live conductor rail, or to allow water issuing from locomotives, hose pipes, hydrants, etc. to come into contact therewith. (See also Section G. Clause 2.5 of these Working Instructions).

7 Electric shock

Staff concerned with the working of electric trains, or who have to work on or adjacent to the electrified track, shall make themselves familiar with the procedure for dealing with cases of electric shock.

A copy of the instructions for dealing with cases of electric shock shall be exhibited at each station, in a position accessible to the station staff; in each signal box and permanent way cabin, in all workshops used by staff who have to work on, or adjacent to, the electrified lines; in the brake compartment of electric trains, and in maintenance and breakdown vehicles.

8 Switching off electricity in emergency

Any person becoming aware of a derailment, mishap or other emergency, requiring, or likely to require, the electricity to be switched off, shall immediately telephone the Electrical Control Operator or arrange for this to be done. See Section D for isolation procedure.

9 Not to cross track more than absolutely necessary

All concerned are warned against crossing the conductor rail more than is absolutely necessary in the discharge of their duties, and great care shall be taken to avoid contact with the conductor rail in any way.

When it is absolutely necessary to carry material/equipment across the track, extra care shall be exercised to ensure that the material/equipment does not come into contact with the conductor rill, ballast, etc.

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10 Knowledge of electric train movements, etc

Persons in charge shall be thoroughly acquainted with the location of track isolating switches and emergency equipment, and with the requirements for the safe working of electric trains in the area under their control, and any for which they are responsible when "on call". They shall see that their staff are properly instructed on the subject.

11 Interference with electrical equipment

All staff shall exercise vigilance to prevent interference with any portion of the conductor rails, cables or other electrical equipment.

12 Damage to conductor rails, equipment and cables

The location and line(s) affected by damage, smoking, excessive flashing (except normal sparking caused by a passing electric train), is noticed on the conductor rail, cables or other equipment shall be reported immediately to the Electrical Control Operator, either direct or through a Signaller.

13 Insulating gloves and trough covers

(a) Staff working on the electrified line or immediately adjacent to live conductor rails will be supplied with, and shall use, insulating gloves or trough covers, in accordance with departmental instructions. It is essential that this equipment is examined and/or tested in accordance With domestic instructions of the departments concerned.

(b) A pair of insulating gloves shall be held at every station and in each signal box for use in emergency and when not in use shall be kept in the receptacle provided for that purpose.

(c) Damaged or wet insulating equipment of any sort is useless as protection and particular attention is drawn to wet gloves when the moisture extends as far back as the wrist All damaged insulating equipment shall be immediately withdrawn and a replacement requested from the person in charge.

14 Working on the track with conductor rail alive

(a) Rep-airs can be carried out when the conductor rail is alive without danger, provided care is taken not to step on, or touch with the bare hands, the conductor rail or equipment connected thereto.

Special care shall be taken when using shovels, permanent way spanners or other tools in close proximity to the live conductor rail or equipment connected thereto.

(b) Insulating troughs or doves shall be used when necessary and all shovels, permanent way spanners and other tools shall be insulated in an approved manner.

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(c) With the exception of tightening fishplate bolts or knocking in keys/clips, insulating troughs shall be used on a live conductor rail whenever work is being carried out on an adjacent running rail.

(d) Repairs shall not be made to the live conductor rail or its connections without the authority of the Supervisor in charge.

(e) Suitable insulation shall be fitted beneath the conductor rails before signal wires or other bare wires, point rodding, etc., are passed under them.

The use of insulated tools and trough covers will reduce the risk of flashover and inadvertent contact with live conductor rail.

Staff are protected by wearing rubber gloves.

15 Tools, materials etc. to be kept clear of conductor and running rails

Tools, loose materials, ballast, rubbish, coal, ashes, etc. shall be kept clear of cables, cable routes, insulators, bonds and conductor rails particularly where the latter are ramped. Special care shall be exercised in unloading materials and equipment.

All loose objects shall be positioned where they cannot come into contact with the conductor rail, taking into account the effect of vibration and wind.

16 Materials to be removed

Broken rails, fishplates, scrap iron, wire, signal material, etc. shall be at once removed and in no case left near the conductor or running rails.

17 Permanent way trolleys

Trolleys can only be used on 2, line where the conductor rail has been isolated.

18 Clearance for shoes both sides of track

Level crossing timbers, timber trunking, rodding wires, ballast, permanent way, signalling and other material (with the exception of ramps in connection with signalling equipment) shall not be higher than the level of the top of the running rail for a width of two feet (or 600mm) from the inside of the running rail an each side of the track so as to clear the shoes on both sides of the electric trains.

19 Short circuits to be reported

Any short circuit caused while working on the track shall immediately be reported by the Person in charge either direct to the Electrical Control Operator or through a Signaller.

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20 Work affecting cables

Permanent Way or other work which is likely to affect high voltage cables or feeder cables shall not be carried out without agreement between representatives of the Network Rail LNW Track Engineer, Network Rail LNW Signal Engineer and Network Rail LNW Electrification & Plant Engineer.

21 Alterations to permanent way-bonding

Work on the running rails involving the breaking of any bonds or connections affixed thereto, or the continuity of the return circuit through the rails, shall not be carried out without planned arrangements first being made with representatives of the Network Rail LNW Track Engineer, Network Rail LNW Signal Engineer and Network Rail LNW Electrification & Plant Engineer.

Connections from sub-stations shall not be disturbed by anyone other than the Network Rail LNW Electrification & Plant Engineer's authorised representatives.

Temporary bonds shall not be added without planned arrangements first being made with the representative of the Network Rail LNW Signal Engineer.

When any renewals or other works involving the breaking of the running rail are carried out, bonding shall first be installed to the satisfaction of the representatives of Network Rail LNW Track Engineer, Network Rail LNW Electrification & Plant Engineer and Network Rail LNW Signal Engineer.

22 Repairs to permanent way bonding

If the electrical continuity of the running rail is interrupted as a result of a defect occurring, this fact shall immediately be reported to the representatives of the Network Rail LNW Track Engineer, Network Rail LNW Electrification & Plant Engineer and Network Rail LNW Signal Engineer.

In the case of broken running rails; arrangements shall be made for the electricity to be switched off in accordance with Section D, clause 3 of these Working Instructions, to ensure that no return traction current is flowing. A temporary bond shall be then placed across the break to the satisfaction of the representatives of Network Rail LNW Track Engineer, Network Rail LNW Electrification & Plant Engineer and Network Rail LNW Signal Engineer.

In other circumstances a temporary bond shall be placed across the break as soon as possible to the satisfaction of the representatives of Network Rail LNW Track Engineer, Network Rail LNW Electrification & Plant Engineer and Network Rail LNW Signal Engineer.

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23 Defective bonds or insulators

Any bond or insulator observed to be broken or in any way defective shall be reported as quickly as possible to the Electrical Control Operator.

24 Flooding of permanent way

24.1 When flood water is lying on the surface of the permanent way, staff shall take care not to step into it as it can be highly charged with electricity.

24.2 If the electrified line is flooded up to the tops of the sleepers, any person becoming aware of such flooding shall report it at once to the Electrical Control Operator, or to the Signalling Centre Manager at Merseyrail I.E.C.C. stating the depth and extent of flooding. The Electrical Control Operator will decide whether it will be necessary to isolate the affected sections. Traincrews observing such flooding shall report the fact at the next station or signal box, unless they are aware that this has already been reported.

Thereafter, trains in both directions shall be stopped at the last station, signal box or suitable signal before reaching the flooded area, and the Traincrews instructed as necessary.

24.3 If water is more than halfway up either running rail, electric trains, where authorised to run by the Electrical Control Operator, shall not exceed a speed of 5 m.p.h. through the flooded section, in order to prevent water being thrown onto the electrical equipment.

24.4 If water is above the top of either running rail, movement of electric trains through the flooded section of line shall be stopped. Electric trains shall not be moved through the water except in the most urgent circumstances and then only on the authority of a Network Rail Mobile Operations Manager, after consultation on site with the authorised representatives of Network Rail LNW Track and Electrification & Plant Engineers.

24.5 Where circumstances arise requiring staff to step into the water, the conductor rail shall be isolated before they do so.

25 Ice or snow on permanent way

Instructions detailing the action to be taken in the event of ice or snow are issued separately.

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Section D - Isolation of conductor rails

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1 General

1.1 Type of isolation

There are two types of isolation procedure: -

1.1.1 **PRE-ARRANGED ISOLATIONS** - for work programmed to take place on or in the vicinity of conductor rails or equipment connected thereto.

1.1.2 **EMERGENCY ISOLATIONS** - made necessary by any unforeseen incident at or in the vicinity of conductor rails, or equipment connected thereto, requiring the electricity to be switched off immediately.

1.2 Emergency telephones (For T.E.C. system see Section F)

1.2.1 Telephones for emergency use are provided at signal boxes, ground frames, passenger stations, inspection sheds and at other places on the electrified lines.

1.2.2 These telephones are housed in cabinets identified by a white telephone on a green background with the words "Emergency Telephone" printed in white.

1.2.3 These telephones shall only be used for communications on matters concerning the electrification system and the running of electric trains, and for summoning the Emergency Services.

1.2.4 As an alternative to these "Emergency Telephones", any other lineside telephone can be used if this would save time, in which case the message between the person requesting the isolation and the Electrical Control Operator shall be relayed by the Signaller, etc., without delay.

1.2.5 The person calling, or receiving a call from, the Electrical Control Operator, shall state the location from which he is speaking and give his name, grade and department/business.

1.2.6

(a) The Electrical Control Operator shall arrange for the direct telephone communication between the Electrical Control Room and the signal boxes to be tested each day, and the call shall be reciprocated by the Signaller. Details of the test shall be recorded in the E.C.R. log book and the signal box train register/occurrence book.

(b) Other emergency telephones shall be tested weekly and any defects reported as soon as possible to the Electrical Control Operator.

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1.3 Isolating arrangements

1.3.1 The conductor rails can be divided into sections between gaps at sub-sections by the operation of circuit breakers under the control of the Electrical Control Operator. For dividing the conductor rail system into shorter sections, track isolating switches are provided at or near certain stations, junctions, crossings and sidings.

Poles for operating the switches are kept in signal boxes, at stations and in Relocatable Equipment Buildings at level crossings, in the vicinity of the switches.

1.3.2 Isolation Instructions complete with diagrams showing the sections into which the conductor rail system can be divided, are provided in signal boxes and at stations. The method by which each section is to be isolated is described in the instructions.

1.3.3 Only staff who have been trained in the operation of track isolating switches are allowed to operate them, and then only on the authority of the Electrical Control Operator. Rubber gloves shall be worn when operating these switches.

1.3.4 Only staff that are trained in the application/removal of short circuiting bars and devices are allowed to apply/remove them.

2 Pre-arranged isolations

2.1 Arranging for isolations

2.1.1 Work on or near to the conductor rail or equipment connected thereto necessitating it to be isolated shall be arranged in advance and normally included in the Weekly Operating Notice. Such work if of an urgent nature can, however, be arranged at shorter notice with the agreement of the appropriate representatives of the Network Rail Area Operations Manager and the Electrical Control Operator.

2.1.2 When a request for an isolation is made, the line(s) on which the conductor rail is required to be isolated and the limits between which the work is to be carried out, shall be stated so that the effect on electric train working can be assessed.

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2.2 Work on conductor rail between trains

Work on or near to the conductor rail necessitating the isolation and short circuiting of the rail, but which can be performed completely or in stages between the passage of trains, can be so performed without the prior arrangements detailed in clause 2.1 of this Section D. In such a case, an authorised representative of the Department/Business requiring the isolation shall communicate with the Electrical Control Operator, telling him the nature of the work and its location, stating the line(s) concerned and the locations between which it is required to carry out the work; whether the line will require to be blocked to all trains or to electric trains only, and the length of time required for the work, or for the stages of work. Isolation forms shall be complete in accordance with clause 2.4 of this Section D.

2.3 Electrical Control Operator to obtain assurance of blockage

Except in emergency, or for purposes laid down in clause 2.4.5 of this Section D, before isolating any section of conductor rail, the Electrical Control Operator shall obtain an assurance that the line(s) concerned is/are blocked to electric trains, or to all traffic, in accordance with clause 2.4 of this Section D.

In an emergency, the procedure shall be carried out as soon as practicable, after the conductor rail has been isolated.

2.4 Completion of forms AE and AS

2.4.1 The Electrical Control Operator shall communicate with the Signaller/Person in charge of Sidings concerned, giving a numbered message and details of the isolation required, stating the electrical section(s) or sub-section(s) to be isolated, quoting the designation(s) as given in the Isolation Instructions, whether the blockage is required to all trains or to electric trains only, and the agreed time of the isolation.

Where appropriate, the times or gap(s) between trains shall be agreed.

The Electrical Control Operator shall enter the relevant information in Part I Form "AE" (see clause 2.19 of this Section D).

2.4.2 The Signaller/Person in charge of Sidings shall enter the appropriate information in Part I of Form 'AS' (see clause 2.20.of this Section D).

2.4.3 When each Signaller/Person in charge of Sidings is in a position to block the line(s) affected, he shall do so, placing the appropriate reminder appliances on the levers/switches/push buttons concerned. After this has been done the Signaller/Person in charge of Sidings shall inform the Electrical Control Operator and record this on Part 2 of Form "AS". The Electrical Control Operator shall record the appropriate information in Part 2 of Form "AE". An appropriate entry shall be made in the Train Register/Occurrence Book.

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When the line is blocked to electric trains only and specially worded reminders are provided, these shall be used.

2.4.4 To indicate that he fully appreciates the nature and extent of the blockage, each Signaller/Person in charge of Sidings commencing duty shall countersign Part I of Form "AS".

2.4.5 Where switching arrangements are such that electricity shall first be switched off from the whole section to isolate a sub-section, the Electrical Control Operator can, for the purpose of such isolation and by arrangement with the Signaller/Person in Charge of Sidings, switch off electricity from the complete section between the passage of electric trains without blocking the section; but before doing so, he shall confirm that the sub-section(s), which will remain isolated when the switching is completed, is blocked to electric trains or to all trains as appropriate. Electricity shall, however, be restored to the unblocked sub-section(s) as quickly as possible.

2.5 Section or sub-section blocked to electric trains

2.5.1 When it is necessary to block a section or sub-section of line to electric trains only, the fixed signal(s) controlling the entrance to the blocked line shall not be cleared for an approaching train until the Signaller has satisfied himself by telephone, or other means, that the train is not an electric train.

2.5.2 When signals have been cleared for a non-electric train, reminder appliances shall be replaced on the levers/switches/push buttons concerned immediately after the signals have been returned to Danger.

2.6 Movement of electric trains towards isolated sections

If it be necessary to make a movement of an electric train beyond the fixed signal protecting an isolated section or sub-section towards the limiting point as defined in the Isolation Instructions, or to make a non- signalled movement towards such a limiting point, the Signaller can authorise the movement provided that arrangements have been made for a Handsignaller to be stationed at the limiting point and that the Handsignaller has been instructed to place on the rail three detonators, 20 yards (or 20 metres) apart, and to exhibit a red hand signal. The Signaller shall receive confirmation from the Handsignaller that the detonators are on the rail and the red handsignal is being exhibited before authorising the movement. If the detonators are exploded, they shall be replaced.

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2.7 Isolation of conductor rail for issue of Permit to Work

Before a Permit to Work is issued, and after the line(s) has been blocked, the following procedure shall be carried out to isolate the section or sub-section of conductor rail in the sequence given:-

(a) the Electrical Control Operator shall open or arrange to open the circuit breaker(s) necessary to: -

(i) isolate the section concerned, or

(ii) confirm that no current flows through the switch(es) referred to in clause 2.7 (b) of this Section D, where only a sub-section is being isolated.

He shall then take the appropriate action in accordance with the Electrical Control Room Instructions to prevent them being reclosed.

(b) if any sub-sections within this section, other than the sub-section required to be isolated for the work covered by the Permit to Work, are required for electric train operation, the Electric Control Operator shall then operate, or instruct a person or persons authorised to carry out conductor rail switching operations to operate, the track isolating switch(es), (the number(s) of which the Electrical Control Operator shall give). If the Electrical Control Operator is satisfied that because of their location, traffic considerations or any other reason, the track isolating switch(es) concerned will not be carrying load current at the moment of operation, he can authorise their operation without first opening the circuit breaker(s) feeding the section concerned.

When the track isolation switch(es) and, where necessary the changeover switch(es), have been operated into the instructed position, the person(s) who have carried out the operation(s) shall report to this effect to the Electrical Control Operator.

The Electrical Control Operator will then re-close the appropriate circuit breaker(s) to permit electric train operation.

2.8 Issue of authority to test the conductor rail

When the Electrical Control Operator is satisfied that the conductor rail concerned is isolated, he shall authorise the testing of the conductor rail by a Nominated Person giving a numbered message which both shall enter on Part I of Form "B" (see clause 2.21 of this Section D) together with the relevant information.

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The Nominated Person shall then carry out the procedure detailed in clauses 2.9 and 2.10 of this Section, except that another person or persons so authorised can on his behalf apply short circuiting bars. The Nominated Person shall record the relevant information on Part 2 of Form

2.9 Testing and applying short circuiting bars/devices to the conductor rail

2.9.1

(a) the conductor rail shall be tested with an approved testing device and when it has been proved not be live, a short circuiting bar(s) shall be applied to the rails within the isolated electrical section(s) or sub-section(s) to be covered by the Permit to Work, in the immediate vicinity of the work.

(b) rubber gloves shall be worn and a paddle used when applying a short circuiting bar.

(c) when a working party moves to a new position outside the original working limits, the conductor rail shall be tested at the new position and short circuiting bars then applied in accordance with paragraph (a) and a new Permit to Work issued before any work is allowed to commence at the new position.

(d) short circuiting bars/devices shall not be finally removed until all the work is completed, all men and materials are clear of the conductor rail and the Permit to Work is cancelled.

(e) when applying a short circuiting device the connection onto the running rail shall always be made before the connection onto the conductor rail.

2.9.2 If it is desired to fix a short circuiting device to the rails to permit non-electric trains to pass, this can be done only whilst a short circuiting bar is in position. When the device has been secured the short circuiting bar can then be removed.

2.9.3 The short circuiting bar or device shall remain in position whilst work is in progress.

2.9.4 If the work involves the removal of a portion of the conductor rail, or otherwise interferes with the electrical continuity, a short circuiting bar or device shall be applied on each side of the break.

2.9.5 Short circuiting bars or devices shall not be applied at locations where guard boarding is provided between the conductor rail and the adjacent running rails. The bar or device shall be applied at the nearest point within the appropriate electrical section where the conductor rail is not guarded.

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2.10 Issue of Permits to Work

2.10.1 When the Nominated Person is satisfied that the procedure detailed in clause 2.9 of this Section D has been carried out, he shall then issue to each PC/COSS or PICOP a Permit to Work. Part I of Form "C" (See Clause 2.22 of this Section D) shall be used for this purpose which, when completed, will constitute the Permit to Work. The Nominated Person shall record particulars of all short circuiting bars/devices applied and all Permits to Work issued on Part 2 of Form "B" and at the earliest opportunity inform the Electrical Control Operator who shall also record the relevant information on Part 2 on his Form "B".

2.10.2 It is the duty of the Nominated Person issuing the Permit to Work to satisfy himself that the PC/COSS or PICOP fully understands the working limits stated on the Permit to Work and the position of any adjacent live conductor rail.

2.10.3 The PC/COSS or PICOP shall sign Part 1 of the Permit to Work and in turn satisfy himself that each of the men for whom he is responsible fully understands these conditions before commencing any of the work for which the isolation is necessary. If the Person in charge of the work is relieved, he shall similarly inform his relief, and comply with the procedure in clause 2.12 of this Section D.

2.10.4 Each PC/COSS or PICOP for which a Permit of Work is issued shall retain his Permit to Work in his possession until the work is completed or terminated.

2.10.5 The conductor rail shall not be made alive until all Permits to Work for the conductor rail concerned have been returned, correctly cancelled, to the Nominated Person.

2.10.6 The Nominated Person shall be in attendance to issue and cancel each Permit to Work.

2.11 Two or more parties working within the same isolation of conductor rail

If two or more parties are working within the same isolation of conductor rail they can be protected by the same short circuiting bars/devices in accordance with clause 2.9 of this Section D, if applicable. Each PC/COSS or PICOP in charge of each working party shall be issued with a separate Permit to Work showing the working limits of their party.

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2.12 Relief of staff

2.12.1 If the Nominated Person who received authority to test the conductor rail is relieved, he shall confirm that his relief fully understands the extent of the isolation and the time it is due to terminate, and shall hand to his relief his copy of the Form "B" showing the Permits to Work issued for all work being done under the isolation. The relief shall inform the Electrical Control Operator that he is taking up the duties, and quote the Form "B" number, his name and that of the man he is relieving; both shall record the relevant information on their copies of the Form

2.12.2 If a person who has received a Permit to Work is relieved, he shall hand to his relief the Permit to Work which both shall sign in Part 2. The relief shall inform the Nominated Person (either directly or via the Electrical Control Operator) who shall record the change in Part 2 of Form "B". The Nominated Person shall, at the earliest opportunity, inform the Electrical Control Operator who shall record the relevant information on his Form "B".

2.13 Cancellation of Permits to Work

2.13.1 On completion of the work, or at such other stage in the work as can prove necessary and practicable, each PC/COSS or PICOP and Engineering Supervisor shall warn all persons under his charge that electricity is due to be restored, and that they shall keep clear of the conductor rail or equipment connected thereto. Each PC/COSS or PICOP and Engineering Supervisor shall also confirm that all materials are clear and before completing Part 3 of his Permit to Work and returning it to the Nominated Person who shall sign Part 3 thereof and enter the time and date of cancellation in Part 2 of Form "B". The Nominated Person shall confirm that all Permits to Work issued are returned to him.

He shall then confirm that all the short circuiting bars/devices are removed and satisfy himself that the conductor rail is safe for the working of trains.

2.13.2 A short circuiting device shall only be removed whilst a short circuiting bar is in position and the connection onto the conductor rail shall always be removed before the connection to the running rail.

2.13.3 Rubber gloves shall be worn and a paddle used when removing a short circuiting bar.

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2.13.4 The Nominated Person shall then inform the Electric Control Operator that all Permits to Work are in his possession and cancelled, that he is satisfied that all short circuiting bars/devices have been removed and that the conductor rail is safe for the working of trains. The Electrical Control Operator shall record the relevant information in Part 2 of his Form "B". The Nominated Person shall then issue a numbered message to the Electrical Control Operator which both shall enter on Part 3 of their copy of Form "B" cancelling the authority.

2.14 Making the conductor rail alive

After the Electrical Control Operator has received notification that all authorities issued under Form "B" have been cancelled and has received assurances from all Nominated Persons concerned that they are satisfied that the conductor rail is safe for the working of trains, the following procedure shall be carried out:-

(a) the Electrical Control Operator will operate circuit breaker(s) as could be necessary but only after prior consultation with the Signaller(men)/Person in charge of Sidings when this operation would cut off the current to unblocked section(s).

(b) the Electricity Control Operator shall operate, or instruct a person or persons authorised to carry out track isolation switching operations to operate, switches as could be required, giving the number(s) of the switch(es) concerned.

(c) the Electrical Control Operator shall arrange for changeover switch(es), as necessary, be operated to an agreed position by the person authorised to perform this duty.

(d) when the switch(es) have been operated, the person(s) who carried out these operations shall report the fact to the Electrical Control Operator.

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2.15 Cancellation of blockages

When the Electrical Control Operator is satisfied that the conductor rail concerned is alive and electric train working can be resumed, the appropriate following procedure shall be carried out:-

(a) the Electrical Control Operator shall communicate with the Signaller(men)/Person in charge of the Sidings giving a numbered message and inform him that so far as the Electrical Control Operator is concerned, the working of electric trains, or all trains, over the line(s) concerned can be resumed. The Electrical Control Operator shall enter the relevant information in Part 3 of Form "AE" and the Signaller(men)/Person in charge of Sidings shall record the message in Part 3 of Form "AS".

(b) the Signaller(men)/Person in charge of Sidings, who have made arrangements in connection with the isolation, shall remove any reminder appliances and resume normal working. An appropriate entry shall be made in the Train Register/Occurrence Book.

2.16 Superseding blockages

If it is necessary to increase or to reduce the extent of an isolation, the Electrical Control Operator shall arrange for the superseding blockage to be imposed, in accordance with clause 2.4 of this Section D, before the first blockage is cancelled. Appropriate entries shall be made on Forms "AE" and "AS".

2.17 Severe wintry weather - emergency surrender of Permit

During severe wintry weather the Signalling Centre Manager in Merseyrail I.E.C.C. will advise the Electrical Control Operator when it is necessary for the PC/COSS or PICOP and Engineering Supervisor in charge of work on site to keep in touch with the Signalling Centre Manager or the Electrical Control Operator so that, if conditions render it necessary for the electricity to be restored to the isolated section of line before the prescribed time to allow the de-icing train to run, the PC/COSS or PICOP and Engineering Supervisor can be instructed to cancel the Permit of Work on or near to the conductor rail, in accordance with clause 2.13 of this Section D. Upon receipt of such advice from the Signalling Centre Manager the Electrical Control Operator will transmit the information to the Person(s) in charge of work.

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2.18 Isolations associated with the Rule Book, modules P1, T2, T3 & T12

2.18.1 If single line working is put into operation, protection shall be provided in accordance with the Rule Book, Module P1, except that, if the commencing point of the isolated section is less than a quarter of a mile in advance of the crossover to be used, clause 2.6 of this Section D shall be applied.

2.18.2 Where possession of the line, in accordance with Rule Book, Module T3 is taken or protection of the line, in accordance with Rule Book, Module T2 and T12 is applied, protection shall be provided, as normal, except where the commencing point of the isolated section is in rear of the point where protection would normally be located, the protection shall be placed at the commencing point of the isolated section, or in rear of the isolated section.

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