

Working over arrangements for London Underground Limited trains on Network Rail infrastructure (Bakerloo & District lines)

**Safety
Electricity
Accidents
Floods and Snow**

4

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Rule Book modules

AC - AC electrified lines

1 Definitions

These terms have the following meanings wherever they are used in this module.

Along-track conductors

A conductor attached to the overhead line supporting structures, which includes return conductors and autotransformer feeders. These are live at up to 25,000 volts (25 kV) and must be considered as dangerous at all times.

Bond

An electrical connection to or in the running rail traction return circuit, or in a signalling track circuit.

Earthed

When referring to OLE that is normally live, earthed means connected to the traction return running rail either directly or to a structure that is directly connected to that rail.

Electrical Control Operator (ECO)

The person who controls the power supply to the electric traction system and who is responsible for all switching operations.

Electrification fixed equipment

All the lineside equipment that is provided for supplying electricity to electric trains. This includes:

- overhead line equipment and its structures and foundations
- the trackside switching stations
- transformers
- bonding arrangements.

Emergency isolation

An isolation that has been carried out by the ECO when it is essential to switch off the electrical supply immediately, to remove danger to personnel from live OLE.

An emergency isolation is carried out by the ECO switching off the electrical supply to all lines:

- between neutral sections (these are typically 15 miles apart), or
- between a neutral section and the end of an electrified line.

In certain locations, equipment is provided to shorten the area of the emergency isolation.

Isolated

Electrical equipment is isolated when it is disconnected and separated from all sources of electricity supply in a secure way. This does not apply to return conductors which are part of the return current system and cannot be isolated.

Isolation

Isolation is the action of causing electrical sections or sub-sections of the OLE to be isolated.

Overhead line equipment (OLE)

Wires and associated equipment, suspended over or adjacent to the railway line for supplying electricity to electric trains. See diagram AC.1

Pantograph

A device mounted on insulators and fixed to the roof of an electric traction unit. The pantograph head contains carbon strips. When the pantograph is raised and pressed against the underside of the contact wire, electricity is collected from the OLE.

Section

A length of OLE between switching stations or a switching station and a terminal end.

Sub-section

Part of a section that can be isolated from all other lengths of OLE by operating overhead line switches.

Switched off

Electrical equipment that is disconnected and separated from all sources of supply.

2 Dangers of the system

Overhead line equipment (OLE), pantographs and roof-mounted electrical equipment on trains are extremely dangerous and may be fatal if you touch or go near to them, or if you allow anything to touch or go near to them.

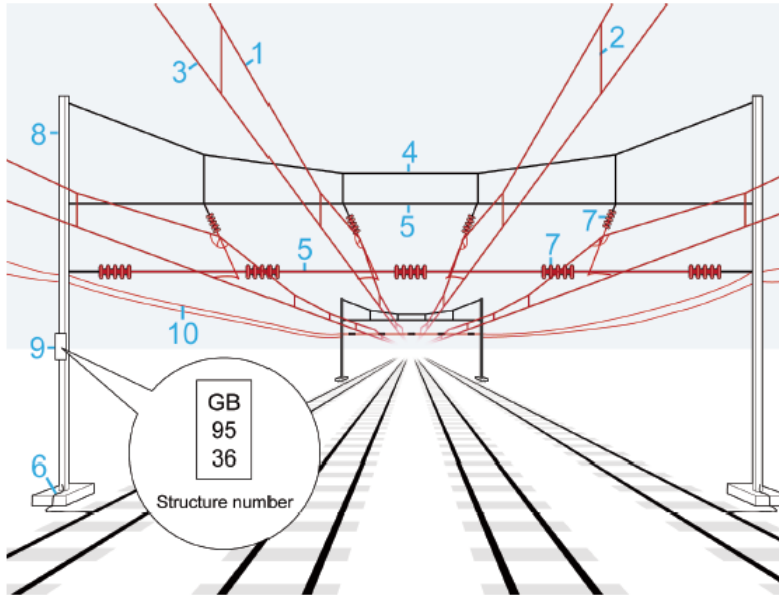
You must treat these items as being **live** at all times unless they have been made safe as shown in the instructions in this module.

3 Description of the system

3.1 The electrification system

The electrification system uses overhead conductors to carry electricity at 25,000 volts (25 kV), 50 hertz alternating current (AC).

Diagram AC.1 shows the details of the components that form the overhead structures.



- | | |
|--------------------|---------------------------|
| 1 Catenary wire | 6 Structure bond |
| 2 Dropper | 7 Insulators |
| 3 Contact wire | 8 Mast/structure |
| 4 Headspan wire | 9 Structure number plate |
| 5 Cross span wires | 10 Along-track conductors |

Diagram AC.1
Typical headspan construction

4 Your safety when on or near the line in an AC electrified area

Note: The instructions in this module do not provide any personal protection from train movements.

4.1 Precautions that must be taken

Except for the mast/structures, you must treat all parts shown in diagram AC.1 as being live at all times and dangerous to life unless:

- the OLE has been made safe in an emergency and an assurance has been received from the Network Rail ECO as shown in section 6 of this module.

4.2 Carrying out work above or within 2.75 metres of live OLE

You must not carry out any work above live OLE or within 2.75 metres (approximately 9 feet) in any other direction from live OLE. See diagram AC.3.

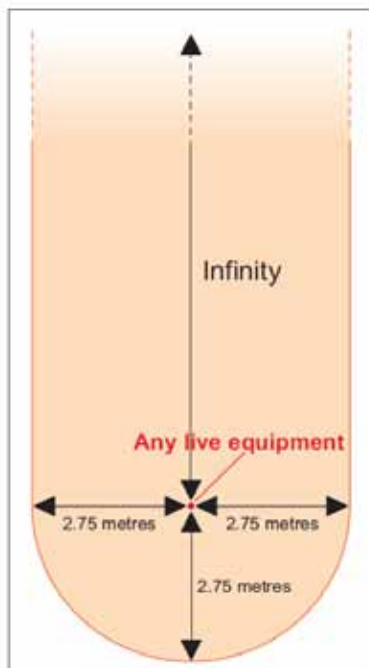


Diagram AC.3
Carrying out work near to the OLE

4.3 Objects on or near the live OLE

You must treat broken or displaced wires and anything attached to or near to the OLE as live and dangerous to life.

You must not remove or approach anything attached to, or near to, the live OLE.

You must not try to remove or approach an object hanging from, in contact with or close to, the OLE unless you have been specially trained and authorised to do so.

You must, as well as carrying out the instructions shown in section 5 of this module, immediately tell the Network Rail ECO, Network Rail signaller or LUL controller if you see any of the following:

- objects that have been thrown onto, are hanging from, or are otherwise touching the OLE
- damage to the OLE
- OLE that is smoking, excessively flashing or fusing
- broken or displaced along-track conductors
- broken or displaced wires connected to the OLE

If the defect will also affect the safe operation of trains, you must first report the defect to the Network Rail signaller.

4.4 Along-track conductors

Along-track conductors carried on insulators must be treated as live and dangerous to life.

The isolation and earthing of adjacent OLE does **not** necessarily make the along-track conductors safe.

4.5 Continuity of running rails

You can treat the traction return current passing through running rails as not dangerous to life.

However, if the rails are broken, a dangerous voltage might be present.

If the defect will affect the safe operation of trains, you must immediately tell the Network Rail signaller.

You must tell the Network Rail ECO of any defect that will interrupt the continuity of the running rail, such as a broken or parted rail.

You must not touch the rails if they are broken.

4.6 Bonds

You must immediately tell the Network Rail ECO if you find a red bond which is either broken or defective.

You must not touch or disturb bonds which are coloured red. If these bonds are disconnected, there could be a dangerous voltage.

4.7 Working on traction units or other vehicles

You must not carry out any activity above door height on a LUL train when it is adjacent to an AC electrified line.

4.8 Using long items

You must take extreme care when using or carrying long items. You must make sure they do not come within 2.75 metres of the OLE.

You must carry long items horizontally and, if necessary, get other people to help you.

5 Communicating with the Network Rail ECO

5.1 Directly or by another person

You can contact the Network Rail ECO directly by telephone, or you can ask another person such as the Network Rail signaller to contact the Network Rail ECO on your behalf.

If another person asks you to contact the Network Rail ECO, you must make sure that you get the necessary information from that person before speaking to the Network Rail ECO. You must also get any other information that the Network Rail ECO asks for.

5.2 Identifying the location from where you are speaking

If you see an unusual occurrence or incident involving the OLE, you must immediately report it. When reporting it, you must check you are speaking to the correct person. You must then state:

- your name, job title and that you are an LUL employee
- the line or lines concerned
- the location (for example the nearest bridge, station, signal or other structure)
- the number of the nearest OLE structure or identifying plate (this will tell the Network Rail ECO where you are)
- the telephone number so the Network Rail ECO can contact you if necessary.

5.3 Formal message numbering system

The Network Rail ECO might use a unique numbering system to handle formal messages. If you are given a message identification number, you must give it each time you speak to the Network Rail ECO.

6 Switching off the electricity in an emergency

6.1 Immediate actions

a) Types of incident

You must immediately contact the Network Rail ECO (or arrange for this to be done) if you become aware of:

- a derailment
- a lineside fire
- a fire on a vehicle or train
- a person in contact with or in danger of coming into contact with the OLE
- damage to the OLE
- an incident or other emergency requiring, or likely to require, the electricity supply to be switched off.

If you receive a message from another person about an emergency, you must pass on all this information to the Network Rail ECO.

b) Reporting an emergency

When you contact the Network Rail ECO, you must first say '**This is an emergency call**'.

As well as the instructions in section 5.2 of this module, you must tell the Network Rail ECO:

- the reason why you have asked for the electricity to be switched off
- **whether any person is in danger from live OLE**
- whether the emergency services are waiting to give assistance.

if you are not at the site, you must relay information from the Network Rail ECO to the site and from the site to the Network Rail ECO.

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