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Issue:	9
Date:	03 June 2023
Compliance date:	03 June 2023

Level 3

Work Instruction

Working On or About 25 kV A.C. Electrified Lines

Approvals

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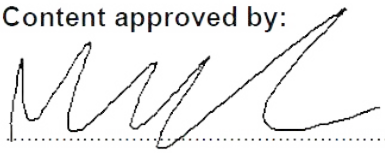

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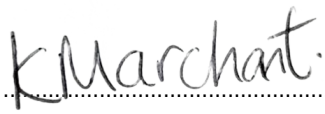

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User information

This Network Rail standard contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *no variations permitted*

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – *variations permitted subject to approved risk analysis and mitigation*

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

Green guidance – *to be used unless alternative solutions are followed*

- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

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Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Limited and its contractors if applicable from 02 June 2023.

Where it is considered not reasonably practicable[1] to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation they shall be complied with irrespective of a project's Governance for Railway Investment Projects (GRIP) stage or Project Acceleration in a Controlled Environment (PACE) phase. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) or PACE strategic development & project selection phase may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 or PACE phase 1 was completed.

NOTE 1: Legislation includes National Technical Specification Notices (NTSNs)

NOTE 2: The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.

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[1] *This can include gross proportionate project costs with the agreement of the Network Rail Assurance Panel (NRAP).*

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Issue record

Issue	Date	Comments
4	June 2015	Incorporation of several outstanding letters of instruction. Changes to wording to improve clarity and consistency. Reformatted and reworded to comply with current 'house style' for the drafting of Network Rail standards. R-A-G indications and definitions added.
5	December 2018	Incorporation of several Emergency Changes with the formalisation of Modules X & Y into the standard. Update of scope excluding areas undertaking the trial of the Single Approach to isolations on 25kV a.c. infrastructure.
6	September 2021	Incorporation of Emergency Changes. Removed the requirement for using alternative arrangements for the issue of OLE Permits. Incorporation of the selection and use of Reminder of Live Exposed (RoLE) Equipment.
7	June 2022	Incorporation of the Sunderland Metro Systems Operating Area isolation and earthing procedure into Module Z. Update of scope to reflect this change and removal of reference regarding trial of the Single Approach to isolations on 25kV a.c. infrastructure
8	September 2022	Update of terminology:- • Circuit Main Earth (CME) – Replaces Duplicate Earth • Additional Earth – Replaces Intermediate Earths • Disconnector – Replaces Switch
9	June 2023	Addition of new Electric Control at Derby

Reference documentation

GE/RT8000	Railway Group standard: Rule Book
NR/L2/CTM/014	Competence & Training In Overhead Line Engineering
NR/L2/CTM/018	Competence & Training In Traction Power Distribution Engineering
NR/L2/ELP/21088	General Maintenance Parameters for Overhead Line Electrification Equipment
NR/L2/ELP/24011	Network Rail standard: Booster Transformer Outages

NR/L2/ELP/24013	Network Rail standard: Notification of Energisation of New AC and DC Electrified Lines
NR/L2/ELP/27550	Traction Power Isolation Documentation
NR/L2/ELP/27715	Overhead Contact System design specification
NR/L2/RVMP/0200	Infrastructure Plant Manual
NR/L2/ELP/27314	Test & Commissioning of New or Modified Overhead Contact Systems
NR/L2/OHS/019	Safety of people at work on or near the line
NR/L3/ELP/21067	Network Rail standard: Instructions for Making Out, Issuing and Cancelling High Voltage Permits-to-Work, Sanctions-for-Test and Circuit State Certificates
NR/L3/ELP/27237	Network Rail standard: Overhead Line Work Instructions
NR/L2/ELP/21085	Network Rail standard: Specification for the Design of Earthing and Bonding systems for 25 kV AC Electrified Lines
NR/L2/ELP/21131	Network Rail standard: Warning and Other Signs for AC and DC Electrified Lines
NR/SP/ELP/27203	Network Rail standard: Provision of Isolation, Earthing and Indication Facilities where Local Isolations are Permitted on AC Electrified Lines
NR/SP/ELP/27205	Network Rail standard: Installation and Operation of Buffer Sections and Permanently Earthed Sections in AC Overhead Line Equipment

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1 Purpose

This modular standard sets out a consistent approach to working on or about 25 kV electrified lines in relation to the dangers arising from proximity to live equipment. This overarching standard for the modules provides an introduction to the suite of modules and consistent use of terminology in the application of the standard.

This standard and each of its modules should be read in conjunction with all other standards relevant to the activity to be undertaken.

NOTE: Further requirements are contained in the Rule Book Module AC (GE/RT8000/AC) and Handbook 16 (GE/RT8000/HB16).

Compliance with this standard will mitigate the risks of electric shock or equipment damage resulting from uncontrolled approach to, or contact with, live overhead line equipment, high voltage bushings or cable sealing ends or through mishandling of conductors carrying electric traction current. Compliance with this standard will also mitigate the risks of injury or equipment damage resulting from incorrect or uncoordinated installation, testing, operation, maintenance, repair and dismantling of 25 kV a.c. electrified equipment.

2 Scope and Modules

This standard applies to all those required to work on 25 kV a.c. electrified lines, or so near to them that danger might arise, including persons who:

a) assess electrical risk;

b) plan, prepare and implement mitigations of electrical risk such as isolating, earthing and issuing of formal safety assurance documents;

c) install, test, operate, maintain, repair and dismantle 25 kV a.c. overhead line equipment and traction return systems;

d) use special tools to work on live overhead line equipment; or

e) work on rail vehicles or other equipment within 2.75 metres (9 feet) of overhead line equipment normally energised at 25 kV a.c.;

f) work on or about any future sections of electrification on Network Rail controlled infrastructure and areas required to adopt a process for securing points of disconnection to form points of isolation to implement a Supplementary Isolation Process (Module X);

g) plan, prepare and implement isolations on 750V d.c. overhead line equipment system (Sheffield Tram Train – Module Y);

h) plan, prepare and implement isolations on 1500V d.c. overhead line equipment system (Sunderland Metro Systems Operating Area – Module Z).

It is applicable to Network Rail personnel and to Network Rail's contractors.

To provide a consistent approach to working on or about 25 kV a.c. electrified lines, Train Operating Companies may, as best practice, apply this standard to infrastructure they control.

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X	Securing of points of disconnection for earthed isolations on new electrification infrastructure	5	03/09/2022
Y	Isolation and Earthing of Sheffield Tram Train D.C. Overhead Electrified Lines.	4	03/09/2022
Z	Isolation and Earthing of Sunderland Metro D.C. Overhead Electrified Lines	2	03/09/2022

3 Definitions

For the purpose of this standard, the terms and definitions in Table 1 apply.

Additional Earth	Earthing equipment, of sufficient strength and current-carrying capability to discharge electrical energy to earth, which is applied at a Site of Work and recorded in the relevant process documentation. *NOTE Single portable earths are specifically rated and product accepted for use as an Additional Earth. Additional Earths and CMEs are recorded on the EIDF.*
Alternative feed disconnector	Overhead line disconnector which connects a subsection of OLE to either of two other subsections of OLE. Alternative feed disconnectors may also be used to provide a supply to other electrical equipment from either of two sections of OLE.
APC track inductor	Magnet fixed on the sleeper ends before and after a neutral section which operates the automatic power control system on a train.
Authorised person (AP)	Person who holds a certificate to show that they are competent to carry out specific duties in relation to the requirements of this standard.
Authority to test (Form B)	Form of declaration issued by an Electrical Control Operator to a Nominated Person using the Form B 'Authority to Test'. *NOTE The purpose of the Form B is to tell the Nominated Person exactly which equipment is switched off and to grant permission to commence testing and applying portable earths.*
Automatic dropping device (ADD)	Device which automatically lowers the pantograph to minimise damage to the overhead line equipment if: a) the pantograph carbons are displaced or the head is damaged; **or** b) the pantograph head becomes damaged or detached; **or** c) the pantograph height limit is exceeded.

Automatic power control (APC)	Means by which the electric power circuits on the traction unit are: a) automatically switched OFF before a train enters a neutral section; **and** b) automatically switched ON after a train leaves a neutral section. *NOTE: This is also used where a permanently earthed section under which electric trains can run is installed beneath a very low bridge. See 'Permanently earthed section'.*
Autotransformer (AT)	Transformer with a single winding that is centre tapped to provide a zero potential traction return connection. The +25 kV terminal is connected to the catenary and the –25 kV terminal is connected to the autotransformer feeder. *NOTE: An autotransformer is used in this way as a device to assist with system voltage regulation and reduce to a minimum any interference with lineside equipment.*
Autotransformer feeder (ATF)	Live bare conductor or cable, connecting the 25 kV terminals of adjacent autotransformers. The autotransformer feeder is normally a bare conductor mounted upon 25 kV insulators directly above the mast on cantilever and headspan structures, or directly above the uprights of a portal structure.
Autotransformer feeding system	System of electrification in which the supply transformer secondary voltage is 50 kV, centre tapped to earth. Two live 25 kV secondary connections are made to the catenary and autotransformer feeder wires respectively. The earthed centre tapping is connected to the traction return circuit. Autotransformers are installed at intervals along the system to assist with voltage regulation and system immunisation.
Autotransformer site (ATS)	Building and/or compound containing electrical switchgear, autotransformers and other electrical equipment which is arranged to connect the autotransformers to the autotransformer feeders, overhead line equipment and traction return rails. The switchgear is also arranged so as to connect together a number of sections of overhead line equipment and autotransformer feeders at that location.

Auxiliary catenary wire	Bare stranded conductor which is the middle wire where there are three vertically spaced wires in the overhead line equipment. It is suspended from the catenary wire. The contact wire is suspended from the auxiliary catenary wire.
Bare feeder (BF)	Bare live conductor, forming a connection between two separate electrical sections or a switching station and the overhead line equipment and identified as such on an isolation diagram. *See 'Riser'.*
Block To Electric Trains (BTET)	Arrangement between Electrical Control Operator and Route Controller, signal box Supervisor or Signaller to block the line to electric trains. *NOTE 1: The granting of a BTET does not mean that all train movements are stopped on the lines concerned, and where necessary such arrangements are carried out in accordance with the Rule Book GE/RT8000* *NOTE 2: The granting of a BTET does not mean that the electrical supply has been switched off.*
Block to electric trains (Form AE)	Communications or process (and form) initiated by an Electrical Control Operator to arrange for a Route Controller, signal box Supervisor or Signaller to block to electric trains specific lines or routes and to gain confirmation that the block to electric trains has been imposed.
Bond	Electrical connection to or in the running rail traction return circuit, or in a signalling track circuit.
Booster transformer (BT)	Device to induce into the return conductors virtually all the traction return current, so as to minimise electrical interference with communication circuits.
Buffer section	A special example type of Permanent Earthed Section (PES) which is provided at the extremity of energised OLE where it abuts onto equipment not yet declared energised (usually under construction). *See 'Permanently earthed section'.*
Bushing	Special insulator which provides a passage for a conductor through a partition such as a wall or roof and insulates it from the partition.

Cable	Insulated conductor which might be laid directly in or on the ground or in pipe or troughing or attached directly to an overhead line structure or bridge or tunnel wall.
Cant rail	Line of intersection on the vertical profile of a rail vehicle or traction unit at which the bodyside meets the roof.
Catenary wire	Bare stranded conductor which is the uppermost of the wires forming the overhead line equipment.
Caution notice	Notice attached to an overhead line disconnector giving warning that it might form part of an isolation.
Circuit	Arrangement of conductors and electrical apparatus connected to an electricity supply.
Circuit breaker	Disconnector arranged to open automatically when a current above a set value or phase angle flows through it.
Circuit Main Earth (CME)	Earthing equipment, of sufficient strength and current-carrying capability to discharge electrical energy to earth at a point where potential inadvertent re-energisation may occur due to the operation of a Point of Disconnection. *NOTE 1 Duplicate portable earths are specifically rated and product accepted for use as a CME.* *NOTE 2 The risk of inadvertent re-energisation at section insulators providing a Point of Isolation may be mitigated through the use of Additional Earths.*
Competent person	*In the context of this standard*, person with sufficient technical knowledge or experience to avoid danger.
Conductor	Material which permits electricity to flow readily through it. *In this context a solid or stranded wire forming part of the overhead line equipment and which carries the electric current.*
Contact wire	Bare solid conductor which is the lowest of the wires forming the overhead line equipment. The pantograph carbons of electric trains press against the underside of this wire and collect the electric current.
Continuity bond (traction)	Bond across the gap in the traction return rails at points and crossings.

Contractor	Organisation contracted to Network Rail for specific work on its infrastructure.
Controller of site safety (COSS)	*As defined in GE/RT8000*. In the context of this standard, Controller of Site Safety is also taken to include Safe Work Leader.
Cross bond (traction)	Bond between the traction return rails of the same track or adjacent tracks.
Cross-span wire	Wire suspended across tracks, holding the overhead line equipment in the correct position.
Current	Rate of flow of electrical charge
Daily Wire	A daily supplement to the Weekly Operating Notice (WON)
De-energisation	Switching off of the electricity supply to overhead line equipment.
Designated earthing point (DEP)	Location at which the overhead line equipment can be earthed, for the purpose of issuing Overhead Line Permits, using short portable earths applied between spigots using insulated earthing poles.
Designated person (DP)	*As defined in GE/RT8000*.
Disconnected	Disconnection of electrical equipment from source of electrical supply.
Disconnection	The operation of an electrical connection to achieve separation (of the equivalent distance of basic insulation) between Live parts and those parts intended to be Disconnected.
Disconnector	A mechanical switching device which provides, in the open position, an isolating distance in accordance with specified requirements. *NOTE: In the context of a.c. and d.c. electrification the term 'Disconnector' includes load break and no-load break lineside Disconnectors and Disconnectors integral to substation switchgear assemblies.*
Dropper	Arrangement of wires or strips and clips by which one wire of the overhead line equipment is suspended from another.
Dual electrified line	Line which is electrified using the 660/750 V d.c. conductor rail system, as well as the 25 kV a.c. overhead line system, to allow trains of either system to operate.

Earth	The general mass of the earth and any conductor in direct electrical connection with it. *NOTE 1: 'Earth', for the purpose of overhead line equipment only, is also used to denote the running rail traction return circuit and the overhead line equipment supporting structures which are connected to it.* *NOTE 2: The term 'earth' is also used to refer to the cable used to form a connection between overhead line conductors and earth. See 'Portable earth'.*
Earth wire	Wire electrically connecting together the steelwork of two or more structures where circumstances prevent each structure from being independently bonded directly to the traction return running rail. The earth wire can be aerial, at ground level or buried.
Earthed	Connected directly to the traction return running rail or to a structure which is itself connected to the traction return running rail *(when used in the context of overhead line equipment which is normally live).*
Earthing connection	Conductor for connecting electrical equipment to earth or to the running rail traction return circuit.
Earthing device	Normally open, remotely controlled disconnector or circuit breaker which when closed connects the OLE to earth.
Earthing pole	Device consisting of a bottom handle section, a primary insulator section and a top section, and other attachments, used for the application and removal of short portable earths, long portable earths and temporary continuity jumpers. *NOTE: An earthing pole may also be used to apply certain voltage testing devices and to operate other approved live line tools.*
Electric train	Electrically powered train with one or more raised pantographs through which electric current is collected from the overhead line equipment. Dual powered, bi-mode or self-powered test trains with a raised pantograph are also classed as electric trains when operating with a raised pantograph. Electrically powered trains are NOT classed as electric trains when ALL pantographs are lowered.

Electrical control (EC)	Secure location accommodating apparatus for the remote control of the electric traction system and the staff who operate it.
Electrical control instructions (ECI)	Specific instructions describing procedures the Electrical Control Operators must follow to carry out their duties, and the actions to be taken circumstances.
Electrical control centre (ECC)	Secure location accommodating apparatus for the remote control of the electric traction system and the staff who operate it.
Electrical control operator (ECO)	Person who controls the power supply to the electric traction system, who is responsible for all switching operations, facilitates isolations of its electrical equipment, and who holds a certificate to show that they are competent in these duties.
Electrical equipment	Equipment used, intended to be used or installed to generate, transmit, transform, rectify, convert, distribute, conduct, control, store, measure or consume electrical energy.
Emergency switch-off	The opening of a switching device intended to remove electrical power from an electrical installation to avert or alleviate a hazardous situation. *NOTE: The 'emergency switch-off' becomes a short notice isolation when the Nominated Person has made the appropriate arrangements and issued Overhead Line Permits.*
EMMIS controller	Controller located in Ashford Control Centre responsible for monitoring and controlling the traction power supply to the Network Rail (High Speed 1 Ltd) controlled electrification system.
Energised	*See 'Live'.*
Feeder	Transmission line or cable in the electrical power distribution system for: a) bringing a supply of electricity to a feeder station; b) connecting a feeder station, track sectioning cabin, track sectioning location or autotransformer Site to the overhead line equipment.

Feeder station (FS)	Building or compound containing electrical switchgear and equipment to which main supplies from the Electricity Supply Industry are brought and from which the overhead line equipment is supplied.
Feeder disconnector	Overhead line disconnector which connects a section of overhead line equipment to its feeder at a switching station. *NOTE: Disconnectors can also have an 'earth' position.*
Fixed Earthing Device (FED)	An earthing device forming a permanent part of the fixed electrification infrastructure that can be used as a Circuit Main Earth or Additional Earth.
Green bond	Connection between the main earthing terminal of a low voltage network and the traction return circuit.
Harmonic damper	Arrangement of 25 kV resistors and capacitors housed in a structure mounted enclosure and connected to the electrification system. Its purpose is to reduce the magnitude of voltage spikes produced by electric trains which would otherwise damage the electrification system.
Headspan	Form of construction where the overhead line equipment is supported by wires suspended from masts on each side of the track.
Headspan wire	Wire suspended across tracks and from which overhead line equipment is suspended.
High Speed 1 (HS1)	High speed line between London (St Pancras International) and Cheriton and its associated chords and connecting lines.
Impedance bond	Device which allows traction return current to flow freely but impedes the flow of track circuit current so as virtually to isolate two track circuits from each other.
Infrastructure maintainer	Organisation responsible for maintenance of the infrastructure.
Infrastructure maintainer's staff	Persons employed by the Infrastructure Maintainer who are competent, and have certificates where appropriate, to undertake specific duties in connection with 25 kV a.c. electrified lines.

Insulated knuckle	Knuckle with insulation between the two sets of overhead line equipment so that one is normally electrically separated from the other, except whilst the pantograph of an electric train passes under it.
Insulated overlap span	Overlap span arranged with insulation between the two lengths of overhead line equipment so that by the opening of a disconnector or circuit breaker, or by the removal of connections, one equipment is electrically separated from the other except while the pantograph of an electric train passes through it.
Insulation	Layer or covering of solid material which provides extremely high resistance to the passage of electricity.
Insulator	Component constructed of rigid insulation designed to provide mechanical support or restraint while separating the live parts of a circuit from each other or from earth.
Isolate	Disconnect and separate securely from all sources of electricity supply. *See 'Isolated'.*
Isolated	Disconnected and separated securely from all sources of electricity supply, in accordance with this standard. *NOTE: It is not possible to isolate the return conductors as they are part of the return current system. The Return Conductor will be considered as isolated if the associated booster transformers have been isolated from all sources of supply as part of the OLE isolation* *In this standard 'isolated' refers to the disconnection, separation and securing of those parts of the overhead line equipment normally live at 25 kV.*
Isolating section	Section of overhead line equipment installed usually at the changeover from a 25 kV a.c. overhead line system to a 660/750 V d.c. conductor rail system, designed to prevent traction return current flowing from one electrification system into another.
Isolating transformer	Type of transformer installed at an isolating section. *See 'Isolating section'.*

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Isolation	Process which causes an electrical section(s) or subsection(s) of the overhead line equipment to be isolated intentionally and, in the context of this standard, to be secured so that in the event of an operational error, failure of a device or instance of material breakdown it will not inadvertently be re-energised through conduction, induction or capacitance so as to present danger. *See 'Isolated'.* *NOTE: An 'Isolation' can be taken to refer to the arrangements for the interruption of the traction electricity supply to a particular part of the railway, including details of the section(s) or subsection(s) or group of section(s) or subsection(s) being isolated, together with the dates and times, and shown as such in the Weekly Operating Notice. It embraces the entire process of disconnection, securing, testing and earthing, and issue of Overhead Line Permits.*
Isolation details form (IDF)	Form produced by a Nominated Person to let all parties involved know in advance the specific details of each isolation.
Isolation diagram	Diagram which shows schematically the electrified lines, the overhead line equipment sectioning, switching and feeding arrangements together with certain relevant signal and point numbers, adjacent overhead power lines and other relevant information. Diagrams use notes to highlight Residual electrical Hazards such as cross-track feeds, live sealing ends etc, these are identified in accordance with NR/L2/ELP/27550 *See Residual Electrical Hazards (REH)*
Isolation instructions	Instructions, in two separate complementary forms, which specify for each section and subsection of overhead line equipment either: a) the electrical switching which normally has to be carried out to effect an isolation of the particular section or individual subsection and the associated limits of the isolated section or subsection for the purpose of issuing Overhead Line Permits; or b) the protecting signals, the limits beyond which electric trains must not proceed and the signals or routes which are not to be used for electric trains, applicable to an isolated section or subsection.

Isolation limits	*See 'Limits of isolation'.*
Isolation plan	Collated and coordinated information which defines, in advance, an isolation in terms of purpose, extent, timing and resources. *See 'Isolation planning form'.*
Isolation planner	Network Rail nominated representative competent in the isolation planning process, or their appointed agent.
Isolation planning form (IPF)	Form issued by an Isolation Planner to let all parties involved in the isolation planning process know in advance the agreed isolations.
Isolation record book	Document in which isolations carried out under a local isolation procedure are recorded. *See 'Isolation – Local isolation'.*
Jumper	Permanent or temporary electrical conductor which connects two conducting elements together which would otherwise be electrically separate or poorly connected.
Knuckle	Item of equipment used to arrange the meeting of two sets of overhead line equipment at an angle without crossing one over the other. It is designed so that pantographs of electric trains can pass smoothly and without break of electrical contact from one contact wire to the other.
Limits of isolation	Limits stated in the isolation instructions for complete electrical sections and individual subsections, usually in the form of structure numbers, between which the Nominated Person may be authorised (by a message recorded on Form B) to test, earth and issue Overhead Line Permits (Form C).
Line guard	Short length of mechanical protection fitted onto an overhead line conductor to prevent damage to the conductor when portable earths are applied.
Live	At a voltage by being connected to a source of electricity or by induction or capacitance from other live conductors.

Live Line Indicator (LLI)	Device which can be placed in contact with parts of the overhead line equipment normally live at 25 kV while being operated from ground level so as to check that the overhead line equipment under test has been switched off. See 'Voltage testing device'
Local isolation	Isolation carried out locally by a person who has local control over train movements, and so does not need to follow the Form A procedure, and is completed using a lock-off system instead of issuing an Overhead Line Permit.
Local isolation instructions	Instructions for isolating and earthing overhead line equipment at specific locations carried out locally by a person who has local control over train movements. *See 'Isolation instructions'*
Long portable earth	Portable earth longer than 1.5 metres which has blue sheathing, for use at locations other than designated earthing points. *NOTE: It is fitted at one end with a hand applied clamp suitable for attachment to an overhead line structure or traction return rail. At the line (live) end it is fitted with an earthing pole applied clamp suitable for attachment to an overhead line conductor.*
Master bonding plan	Plan drawing, jointly agreed by the relevant Route Asset Managers, which shows the tracks, track circuit and traction return rails and the bonding arrangements.
Method statement	Statement in a required format of the methods, systems, tools, plant and equipment and competence of persons to be used in performing a particular task, for the purpose of demonstrating that safety is not prejudiced. Example formats include: • work package plans, • task briefing sheets, • work instructions, and • risk control sheets.
Mid point connection (MPC)	*See 'Bond – Return conductor-to-rail bond'.*
Motorised disconnector	Power-operated overhead line disconnector which can be remotely controlled. *NOTE: Disconnectors can also have an 'earth' position.*

Mutual screening conductor (MSC)	A separate conductor located alongside telecommunications cables, independently earthed down to copper rods at typically 1 km intervals. *NOTE: The inductive coupling to the 25 kV OLE results in it carrying a current in opposite phase which suppresses the interference (value of longitudinal voltage VL) induced in the telecoms cables.*
Network Rail (NR)	Organisation owning and controlling the railway infrastructure.
Network Rail controlled infrastructure	*As defined in the Network Rail Railway Safety Case.*
Network Rail route	Geographical subdivision of Network Rail.
Network Rail route control(ler)	Network Rail organisation (person) that controls Operations.
Neutral section (NS)	Arrangement of insulators installed in the overhead line equipment which is designed so that two sections which must not be connected electrically are kept separated even during the passage of pantographs of electric trains.
New overhead line equipment	Overhead line equipment that is complete in every respect but is not yet in operational use. See '*Overhead line under construction'* ***NOTE All new OLE, or OLE under construction which is physically connected to existing OLE is treated as live.***
Nominated person (NP)	Person certificated as competent to carry out isolation and earthing, to issue and cancel overhead line permits or other authorities to work as defined in local isolation instructions, and nominated as such with electrical control in relation to particular equipment or locations.
Normally open disconnector	Overhead line disconnector which, when required, connects two normally separate sections or subsections of overhead line equipment so as to provide an alternative electrical feed but is kept open in normal feeding arrangements.
Occurrence Book	A book kept by signallers to record the passage of trains, transmission of bell signals and any exceptional circumstances.

Overhead line equipment (OLE)	Arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with its associated fittings, insulators and other attachments including risers, feeders, autotransformer feeders, overhead line disconnectors, jumpers and return conductors. *NOTE: The term 'overhead line equipment' is sometimes used in a narrower sense to describe the electrical circuits of the overhead line contact system when it is necessary to distinguish them from those of the autotransformer feeders.*
Overhead line jumper	Flexible conductor which is a component of the overhead line equipment and which connects other parts of the overhead line equipment together electrically.
Overhead line permit (Form C)	Form of declaration signed and issued by a Nominated Person to the Controller of Site Safety (COSS) concerned with the work to be carried out on or near to electrical equipment using the Form C 'Overhead Line Permit'. *NOTE 1: The purpose of the form is to make known to the COSS exactly which equipment is isolated and earthed, and upon which, or near to which, it is safe for the specified work to commence so far as the electrical equipment is concerned.* *NOTE 2: The issue of an Overhead Line Permit does not mean that train movements are stopped on the lines concerned and where necessary such arrangements are carried out in accordance with Rule Book GE/RT8000.*
Overhead line disconnector	Non-load-breaking device, mounted on an overhead line structure, for opening or closing an electrical circuit.
Overhead line under construction	Overhead line equipment that is not complete and is in the process of being built. See '*New overhead line equipment*'
Overlap span	Portion of track where the ends of two lengths of overhead line equipment are vertically graded and overlap so that the pantographs of electric trains can pass smoothly and without break of electrical contact from one contact wire to the next over the same track.

Pantograph	Vertically extendable mechanism, mounted on insulators on the roof of electric traction units, the head of which carries carbon strips which, when the pantograph is raised, press against the underside of the contact wire and through which the electric current is collected from the overhead line equipment.
Permanently earthed section (PES)	A subsection of overhead line equipment permanently connected to earth, but treated as live OLE with respect to the requirements for isolation, testing, earthing and issue of Overhead Line Permits. *In some circumstances electric trains can run under them (e.g. where installed beneath very low over-line bridges).*
Point of Disconnection	*See 'Module X definition'*
Point of Isolation	The point at which separation of the electrical equipment from every source of electrical energy is achieved in such a way that disconnection and separation is secure. *Note: Limits of isolations stated in isolation instructions in accordance with Network Rail standard NR/L2/ELP/27550*
Possession Planning System (PPS)	A single system for the recording of national engineering and access requirements. These requirements are captured in real time as possessions, worksites and Temporary Speed Restrictions.
Portable earth	Portable appliance of an approved type consisting of a length of sheathed flexible cable provided with electrical clamps at each end and used to establish electrical connection between overhead line conductors and earth. *See Notes under 'Earth'.*
Protection wire	Wire connected to the non-live side of insulators, and insulated from earth, to act as a path for any fault current from insulator flashover to the traction return circuit, where this is insulated from masts, etc. *It is usually associated with isolating sections.*
Public Area	Areas to which the public lawfully have access and public standing surfaces, e.g. stations, public footpaths and level crossings etc.

Rail For London Infrastructure (Elizabeth Line) (RFLI)	The Elizabeth Line is primarily a high frequency tunnel railway which connects the Great Eastern Main Line in the East near Stratford Main Line Station with the Great Western Main Lines in the West near Paddington Main Line Station.
Rail joint bond	Bond across a joint in the running rails.
Red bond	Bond which, if disconnected, could result in either the bond or the equipment to which it is connected rising to a dangerous voltage.
Reminder of Live Exposed (RoLE) Equipment	Equipment installed on the infrastructure to act as a visual reminder of the safe working limits stated on the overhead line permit (Form C) or residual electrical hazards.
Residual electrical hazard (REH)	Live equipment within the safe working limits, the location and nature of which are added to the Form C and briefed to the Controller of Site Safety, Safe Work Leader or other recipient of the Form C. *NOTE: Examples include (but are not limited to):* • *cross track feeders,* • *cable sealing ends,* • *adjacent energised equipment.*
Return conductor (RC)	Conductor attached to the overhead line equipment supporting structures, generally at the side of the track, which carries traction return current. In some areas it is carried on insulators and can also be used with booster transformers. At certain places it is sheathed with insulating material, but otherwise it is bare. In other areas it is not carried on insulators, is in electrical contact with the structures and also fulfils the function of an earth wire. *See 'Conductor'.*

Return conductor-to-rail bond	Bond from the traction return rail to the return conductor, often called a 'mid point connection'. *NOTE: These will usually be 'Red bonds'.*
Return screening conductor (RSC)	Insulated cable acting as a lineside longitudinal bond and connected at regular intervals to the traction return rail. *See 'Bond'.* *NOTE 1: For the purposes of this standard, a return screening conductor is considered as a continuity bond.* *NOTE 2: A return screening conductor is provided for immunisation purposes and is normally in close proximity to signalling and telecommunications cables.*
Riser	Bare solid or stranded conductor run between the roof bushing or sealing end of a switching station and the overhead line equipment, not identified as a bare feeder on an isolation diagram. *See also 'Bare feeder'.*
Risk assessment	Structured process to evaluate the consequences of certain tasks or activities.
Route Control Centre (RCC)	Secure location accommodating apparatus for the remote control of the electric traction system and the staff who operate it.
Safe work leader (SWL)	*See 'Controller of Site Safety (COSS)'.*
Safe work limits	Limits stated on an Overhead Line Permit (Form C), usually in the form of structure numbers, between which it is safe to work.
Sealing end	Special insulator which secures the termination of a cable and is mounted on an overhead line structure or on a special structure.
Section	Length of overhead line equipment between switching stations, or between a switching station and a terminal end.
Section insulator (SI)	Insulation introduced between two sections of overhead line equipment to provide electrical separation except during the passage of pantographs and arranged so that pantographs can pass from one section to the other smoothly and without break of electrical contact.

Section disconnector	Overhead line disconnector which connects one subsection of overhead line equipment to another in normal feeding arrangements. *NOTE: Disconnectors can also have an 'earth' position.*
Short circuit	Introduction of a path of low resistance to electric current either between conductors which are connected to an electricity supply or between a live conductor and earth. *NOTE: This will normally cause circuit breakers to switch off the electricity supply.* *See 'Circuit'.*
Short portable earth	Portable earth for use at designated earthing points which has orange coloured sheathing. *NOTE 1: It is a maximum of 1.5 metres long so as to minimise the risk of electric shock to persons at ground level should the earth end become detached accidentally*. *NOTE 2: Electrical clamps are fitted to each end that are suitable for attachment to the designated earthing point spigots using an insulated earthing pole.*
Siding disconnector	Overhead line disconnector which connects the overhead line equipment of a siding or group of sidings to another subsection of overhead line equipment in normal feeding arrangements. *NOTE: Disconnectors can also have an 'earth' position.*
Spider plate	Metal plate used as the point of common connection where a number of bonds from different connection points require to be commonly connected, or to provide a link in an unduly long bonding connection to facilitate maintenance and repair.
Stitch wire	Conductor suspended from the catenary wire, and from which the contact wire is suspended, at overhead line supporting structures. *See 'Auxiliary catenary wire'*
Structure to Rail bond	Bond connecting the steelwork of an overhead line equipment structure, or bridge, or other metal structure, to the traction return circuit.
Structure mounted outdoor switchgear (SMOS)	Form of lineside switching station construction, using outdoor type switchgear mounted on steel masts.

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Subsection	Part of a section which can be isolated from all other lengths of overhead line equipment by the operation of overhead line disconnectors. *See 'Section'.*
Supervisory control and data acquisition (SCADA)	Electrical system for the remote control of electrical equipment at switching stations, motorised overhead line disconnectors and other locations.
Supplementary conductor	Conductor supported on insulators attached to the overhead line equipment supporting structures and which is connected to and in parallel with the catenary and contact wire for the purpose of reducing the electrical impedance of the overhead line equipment. *See 'Conductor'.*
Supplementary Isolation Process (SIP)	A process for securing of points of disconnection using a unique padlock (creating a point of isolation)
Switched off	Disconnected and separated from all sources of electricity supply. *NOTE On a.c. systems it is not possible to switch off return conductors as they are part of the return current system. 'Switched Off' refers to the disconnection of those parts of the OLE normally energised at 25 kV.*
Switching	The act of operating a disconnector or circuit breaker to modify the feeding configuration to either disconnect, provide alternative feeding arrangements, or place an earthing device into the earth position.
Switching station	Site of lineside equipment arranged together to provide remote switching of the power supply to the overhead line equipment. NOTE: *This includes feeder stations, autotransformer feeder stations, track sectioning cabins, track sectioning locations and autotransformer sites.*
Tag	Reminder device attached to an overhead line disconnector key which warns that the disconnector it relates to forms part of an isolation.
Tee-feed	Single supply at a feeder station feeding overhead line equipment in both directions.

Temporary continuity jumper	Length of sheathed flexible cable provided with electrical clamps for use as a temporary connection to bridge a gap, e.g. when the electrical continuity of the overhead line equipment is disturbed, or in a pipe, running rail or cable sheath. It has blue coloured sheathing.
Terminal end	Point where the overhead line equipment is terminated both physically and electrically i.e. does not butt up to or overlap with any other overhead line equipment. *NOTE: An overlap or cross-over or similar does not constitute a terminal end. However, in particular circumstances, a neutral section can be regarded as a terminal end (see Module 7).*
Testing	Using a voltage testing device. *See 'Voltage testing device'.*
Track sectioning cabin (TSC)	Building containing enclosed electrical switchgear and equipment which is arranged to connect together a number of sections of overhead line equipment.
Track sectioning location (TSL)	Compound containing outdoor electrical switchgear and equipment which is arranged to connect together a number of sections of overhead line equipment.
Traction current	Flow of electricity to the electric traction units through the overhead line equipment and back through the return circuit.
Traction return circuit	Path by which the traction current returns from traction units to the Feeder Station, incorporating the traction return rails, bonding connections, return screening conductors, return conductors and booster transformers. *NOTE: Autotransformers and autotransformer feeders are also part of the traction return circuit but are not normally classed as such.*
Train Register	A book kept by signallers to record the passage of trains, transmission of bell signals and any exceptional circumstances.
Transformer	Apparatus for supplying an alternating current at one voltage when fed with alternating current at another voltage.
Transposition bond (traction)	Bond connecting two traction return rails where the traction return rail changes from one side of the track to the other.

Tripping	Circuit breaker opening automatically when it detects a fault or an overload.
Uninsulated overlap span	Overlap span arranged so that the two lengths of overhead line equipment are permanently electrically connected.
Voltage testing device	Device which can be placed in contact with parts of the overhead line equipment normally live at 25 kV while being operated from ground level so as to check that the overhead line equipment under test has been switched off. See 'Live Line Indicator (LLI)'
Weekly Operating Notice (WON)	Contains information related to engineering work, alterations to track and signalling arrangements, local operating instructions and localised amendments
Yellow bond	Bond which is required for track circuit integrity and normally also for traction return purposes.

Table 1 – Terms and definitions

Standard and control document briefing note

Ref: NR/L3/ELP/29987	**Issue:** 9
Title: Working on or About 25 kV A.C. Electrified Lines	
Publication date: 03 June 2023	**Compliance Date:** 03 June 2023
Standard/Control Document Owner: Professional Head of Contact Systems (AC/DC)	
Standard change lead/contact for briefings: David Campbell	**Tel:** 07734 649538

Purpose:

This modular standard sets out a consistent approach to working on or about 25 kV electrified lines in relation to the dangers arising from proximity to live equipment. This overarching standard for the modules provides an introduction to the suite of modules and consistent use of terminology in the application of the standard.

This standard and each of its modules should be read in conjunction with all other standards relevant to the activity to be undertaken.

NOTE: Further requirements are contained in the Rule Book Module AC (GE/RT8000/AC) and Handbook 16 (GE/RT8000/HB16).

Compliance with this standard will mitigate the risks of electric shock or equipment damage resulting from uncontrolled approach to, or contact with, live overhead line equipment, high voltage bushings or cable sealing ends or through mishandling of conductors carrying electric traction current. Compliance with this standard will also mitigate the risks of injury or equipment damage resulting from incorrect or uncoordinated installation, testing, operation, maintenance, repair and dismantling of 25 kV a.c. electrified equipment

Scope:

This standard applies to all those required to work on 25 kV a.c. electrified lines, or so near to them that danger might arise, including persons who:

a) assess electrical risk;

b) plan, prepare and implement mitigations of electrical risk such as isolating, earthing and issuing of formal safety assurance documents;

c) install, test, operate, maintain, repair and dismantle 25 kV a.c. overhead line equipment and traction return systems;

d) use special tools to work on live overhead line equipment; or

e) work on rail vehicles or other equipment within 2.75 metres (9 feet) of overhead line equipment normally energised at 25 kV a.c.;

f) work on or about any future sections of electrification on Network Rail controlled infrastructure and areas required to adopt a process for securing points of disconnection to form points of isolation to implement a Supplementary Isolation Process (Module X);

g) plan, prepare and implement isolations on 750V d.c. overhead line equipment system (Sheffield Tram Train – Module Y);

h) plan, prepare and implement isolations on 1500V d.c. overhead line equipment system (Sunderland Metro Systems Operating Area – Module Z).

It is applicable to Network Rail personnel and to Network Rail's contractors.

To provide a consistent approach to working on or about 25 kV a.c. electrified lines, Train Operating Companies may, as best practice, apply this standard to infrastructure they control.

What's new, what's changed and why:

To enable use of a new Electrical Control at Derby as part of Midland Main Line Upgrade:

Parent, Updated index of module revision,.

Module 1, Appendix A of NR/L3/ELP/29987 addition of the contact numbers for the new Derby Electrical Control

Module 7, Appendix A of NR/L3/ELP/29987 details the new boundary interface between Derby Electrical Control and York South Desk Electrical Control at the Midlands Road (Canal Tunnel).

Reasons for change

Network Rail are installing a new Electrical Control at Derby as part of Midland Main Line Upgrade.

Detail of change:

Parent, Updated index of module revision,.

Module 1, Appendix A of NR/L3/ELP/29987 addition of the contact numbers for the new Derby Electrical Control

Module 7, Appendix A of NR/L3/ELP/29987 details the new boundary interface between Derby Electrical Control and York South Desk Electrical Control at the Midlands Road (Canal Tunnel).

Affected documents

Reference	Issue	Impact	Document type
NR/L3/ELP/29987	8	Supersede	Standard
NR/L3/ELP/29987/01	8	Supersede	Module
NR/L3/ELP/29987/07	8	Supersede	Module

Briefing requirements:

Briefings are given to those who have specific responsibilities within, or are directly affected by, this standard/control document.
A copy of briefings may be available from the Standards & Controls intranet site or IHS.
Requirements to cascade briefings are described within any implementation plans.

Briefing *(D-Detailed O-Overview)*	Post	Function	Responsible for cascade briefing? Y/N
D	Operative [Overhead Line Equipment]	Regions	N
D	Technician [Overhead Line Equipment]	Regions	N
D	Team Leader [Overhead Line Equipment]	Regions	N
D	Section Supervisor [Overhead Line Equipment]	Regions	Y
D	Section Manager [Overhead Line Equipment]	Regions	Y
D	Technical Officer [Electrification & Plant]	Regions	N
D	Senior Technical Officer [Electrification & Plant]	Regions	N
D	Principal Technical Officer [Electrification & Plant]	Regions	Y
D	Assistant Electrification & Plant Maintenance Engineer	Regions	N
D	Electrification & Plant Maintenance Engineer	Regions	Y
D	Principal Route Engineer [Electrification & Plant]	Regions – NW&C	Y
D	Head of Engineering & Asset Management (Electrification & Plant)	Regions – W&W	Y
D	Route Engineer (E&P)	Regions – Eastern (EC, NE & EM)	Y
D	Route Engineer (Contact Systems)	Regions – Eastern (Anglia)	Y
D	Route Asset Manager [E&P]	Scotland	Y
O	Workforce Development Specialist	Route Services	N
O	Programme Manager [OLE Condition Renewals]	Route Services	N
O	Construction Manager (OLE)	Regions	N
O	Senior Project Engineer [OLE]	Regions	Y
D	Programme Engineering Manager	Regions	Y
D	Senior Project Engineer (E&P)	Regions	Y
D	Project Engineer (E&P)	Regions	N
O	Senior Project Engineer	Regions	Y
O	Project Engineer	Regions	N
T	Designated Project Engineer	Regions	Y

O	Senior Programme Engineering Manager	Regions	Y
O	Senior Design Engineer	Regions	Y
O	Principal Design Engineer	Regions	Y
O	Head of Operations Principles & Standards	Technical Authority	Y
D	Electrical Control Room Operator Manager	Regions	Y
D	Electrical Control Room Operator	Regions	N
O	Programme Engineering Manager (Works Delivery)	Regions	Y
O	Programme Manager (Works Delivery)	Regions	Y
O	Project Manager (Works Delivery)	Regions	N
O	Local Operations Manager	Regions	Y
O	Mobile Incident Officer	Regions	N
O	Programme Engineering Manager (OLE Condition Renewals - OCR)	Route Services	Y
O	Senior Project Engineer (OCR)	Route Services	Y
O	Project Engineer	Route Services	Y
O	Assistant Project Engineer	Route Services	Y
O	Technician – OCR	Route Services	Y
O	Section Manager – OCR	Route Services	Y
O	Section Supervisor – OCR	Route Services	Y
O	Team Leader – OCR	Route Services	Y
O	Head of Route Health, Safety and Environment	Regions	Y
O	Workforce Health Safety & Environment Advisor	Regions	Y
D	Section Administrator (OLE)	Regions	Y
D	Section Planner (OLE)	Regions	Y
O	Principal Technical Officer	Regions	Y
O	Senior Technical Officer	Regions	Y
O	Infrastructure Maintenance Services Manager	Regions	N
O	Current Operations Manager	Regions	Y
O	Route Control Manager (ICC)	Regions	Y
O	Planning Manager	Regions	Y
O	Lead Planner (Access)	Regions	Y
O	Planning Specialist (Access)	Regions	Y
D	Isolation Planner (Route) & (Delivery)	Regions	N

O	Maintenance Engineer	Regions	Y
O	Assistant Maintenance Engineer	Regions	Y
O	OTP Specialist	Regions	N
O	Section Manager	Regions	Y
O	Section Supervisor	Regions	Y
O	Working Supervisor	Regions	Y
O	Team Leader	Regions	N
O	Infrastructure Maintenance Delivery Manager	Regions	N

Briefing *(D-Detailed O-Overview)*	**Role**	**Function**
O	E&P Training Delivery Specialist	Route Services
O	Technician - OLE Condition Renewals	Route Services
O	Supervisor - OLE Condition Renewals	Route Services
O	Construction Manager - OLE Condition Renewals	Route Services

NOTE: *Contractors are responsible for arranging and undertaking their own Detailed and Overview Briefings in accordance with their own processes and procedures.*