

Category 1 Standard

S1114 Safe Systems of Work on or Near Electrical Equipment

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**Please read the
Written Notices
attached to this
standard**

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1 Purpose

- 1.1 The purpose of this Standard is to define the requirements for the planning and implementation of isolations, working on or near exposed live conductors, and the assessment and recording of the competence of persons involved in such activities.
- 1.2 For work on or adjacent to high voltage or lead sheathed DC cables in particular the purpose of this Standard is to ensure as far as practicable that:
- a) Persons working on London Underground (LU) premises do not expose themselves, or others, directly or indirectly to hazards arising from the presence of HV or LV power cables (including those for DC traction) as a consequence of the works they are undertaking;
 - b) Existing power cable assets are adequately protected against physical damage when work is undertaken adjacent to them.

2 Scope

- 2.1 This Standard applies to all electrical equipment and is mandatory for LU staff, its maintainers and its suppliers working on behalf of LU, when engaged upon activities involving working on or adjacent to electrical equipment or high voltage cables or lead sheathed DC traction cables.
- 2.2 This Standard defines the requirements for the planning and implementation of work on LU premises, the assessment and recording of the competence of persons involved in such activities and audit of compliance.
- 2.3 This Standard sets out requirements for when working adjacent to cables on LU premises for the development, implementation and monitoring of a Safe System of Work (SSoW) to address these risks. The use of a risk assessment process and the specification of requirements for personnel competency are fundamental components of this SSoW.
- 2.4 The Standard does not cover:
- a) the requirements for working adjacent to signal, control and fibre optic cables, nor in relation to other types of services (air mains, hydraulic pipework etc.), (See standard 1-021 Works near mains services and structures) or;
 - b) the requirements for working on DC traction conductor rails. (See standard TE-HSS-0109-A3 Electrical safety for staff working on the track), and also track access controls contained within the Working Manual.
- 2.5 This standard replaces 1-114 A1. The Standard has been re formatted and re-numbered. There were no technical changes.

3 Requirements

3.1 General Requirements

- 3.1.1 Electrical equipment shall be kept secure against unauthorised access. Access shall only be permitted to persons who are appropriately trained and authorised.



- 3.1.2 All electrical equipment shall be assumed to be live unless it has been isolated, earthed as necessary and proved dead.
- 3.1.3 All persons shall be trained and instructed to ensure that they understand the safety procedures relevant to their work and have sufficient technical knowledge or experience to avoid danger.
- 3.1.4 No person shall be engaged in any work activity on or near electrical equipment unless in possession of appropriate technical knowledge or experience or is under direct supervision appropriate to the work.
- 3.1.5 All test equipment used shall comply with the relevant Standards, be in correct working order and be suitable for its intended use. Test equipment shall be proved before and after use.
- 3.1.6 All protective equipment used, for example, insulated tools, protective clothing and insulating screens, shall comply with the relevant Standards, be maintained in proper condition and be suitable for its intended use.
- 3.1.7 All earthing equipment and cable spiking devices shall comply with the relevant Standards and be capable of withstanding the energy which will flow in the event of re-energisation and be suitable for its intended use.
- 3.1.8 All persons must be in possession of, understand and comply with, the safety rules appropriate to the work activity to be undertaken.
- 3.1.9 Where insulating gloves are used they shall at all times comply with BS EN 60903 Live Working: Gloves and Insulating Material.

3.2 Safety Critical Licensing

It should be noted that much work on electrical equipment on London Underground is covered by The Railway (Safety Critical Work) Regulations 1994. In applying the requirements of this Standard, due cognisance shall be taken of the Competency Assurance Standard 1-266 and the Safety Critical Work Standard 1-548.

3.3 Dead working on electrical equipment

- 3.3.1 No work activity shall be carried out on any uninsulated live HV conductor, other than for essential live testing, for example, use of a voltage indicator.
- 3.3.2 When any work activity is to be carried out on or near electrical equipment under dead working conditions, the following principles apply:

Principle 1

The electrical equipment shall be disconnected and separated from every source of electrical energy;

Principle 2

The disconnection and separation shall be made secure;

Principle 3

Precautions shall be taken to prevent the electrical equipment from becoming electrically charged during the work;



Principle 4

The isolated electrical equipment shall be clearly identified at the worksite.

3.3.3 Disconnection and Separation (Principle 1)

Electricity at Work Regulation 12 refers.

3.3.3.1 The disconnection and separation shall be effected by using the appropriate isolating device(s). Supply fuses and links may be used for this purpose provided that they can be removed and replaced without danger arising.

3.3.3.2 The disconnection and separation shall be verified. This may be achieved by various methods:

- a) wherever practicable by direct observation of the position of the isolating contacts to confirm that the isolation gap or other means of isolation has been established;
- b) by observation of a local indicator provided that this device gives a clear and reliable indication of the position of the isolating contacts, or;
- c) by the insertion of a barrier between the isolating contacts e.g. automatic shutters of withdrawable equipment.

3.3.4 Securing the Disconnection and Separation (Principle 2)

Electricity at Work Regulation 12 refers.

3.3.4.1 The disconnection and separation shall be made secure by preventing unauthorised, improper or unintentional operation of the isolating device(s) by:

- a) mechanically locking off the isolating device(s) or shutters or by preventing the replacement of fuses or links by the use of approved lockable devices, with keys held in safe keeping, and
- b) inhibiting all forms of associated local and remote controls, and
- c) applying clear signing to local and remote controls to show that the isolating device(s) must not be operated. Signing shall be applied at the place(s) of disconnection in the form of clearly visible caution notices as defined in LU Standard S1004 to indicate that the equipment must not be energised. In the case of a remote control panel this shall be in the form of a similar notice together with a reminder device to prevent the inadvertent operation of the associated control device. In the case of remote control employing a VDU system a reminder symbol shall be present when the isolating device is displayed.

3.3.4.2 A system shall be implemented for the safe keeping of keys or withdrawn fuses or links.

3.3.5 Precautions to be Taken to Prevent Charging (Principle 3)

Electricity at Work Regulation 13 refers.

3.3.5.1 In addition to the actions taken under Principles 1 and 2 to prevent the equipment from being charged by connection to a source of supply, the equipment shall be proved dead and shall be earthed before work starts except that earths need not be applied in the following circumstances on low or extra low voltage equipment only:

- a) where the risk of application outweighs the benefit of earthing the equipment to be worked on, or



- b) where it is physically impracticable to apply earths and there is no likely way the equipment can become charged during the course of the work, or
 - c) where it is physically impracticable to apply earths and the available short circuit power is such as not to give rise to a risk of serious injuries.
- 3.3.5.2 Where provided, circuit main earths shall be applied at each point of isolation by purpose-built facilities.
- 3.3.5.3 Each isolated conductor shall be earthed between the worksite and each source of supply, the earths being as close as practicable to the worksite.
- 3.3.5.4 Wherever practicable at least one of the earths shall be located such that it is visible from the worksite.
- 3.3.5.5 Where there is a risk that the isolated conductors may accumulate a charge due to stored energy or become charged as a result of electromagnetic induction or mutual capacitance sufficient additional earths shall be applied at appropriate locations to prevent danger arising.
- 3.3.5.6 Each isolated conductor shall be proved dead at the worksite before work starts. Where a test instrument or voltage indicator is used for this purpose it shall be proved, preferably immediately before and immediately after use.

3.3.6 Identification of Equipment at the Worksite (Principle 4)

Electricity at Work Regulation 12 refers.

- 3.3.6.1 The isolated equipment to be worked on shall be positively identified at the worksite to ensure that the work activity is carried out only on that equipment. This may be achieved by:
- a) reference to circuit and equipment labels;
 - b) reference to accurate circuit records;
 - c) knowledge of the worksite and equipment;
 - d) visual tracing of the circuit from the isolating device(s) or the earthing points to the worksite;
 - e) voltage checks using a test instrument or voltage indicator;
 - f) cable identification using test equipment; or
 - g) cable spiking.
- 3.3.7 Following positive identification the limits of the isolation shall be clearly defined. This may be achieved by the application of danger notices, red flags, tapes, safety barriers or equivalent means. Should there be any risk of mistaking what equipment is to be worked on, then the isolated equipment shall be clearly marked accordingly.
- 3.3.8 Before the work is commenced an assessment shall be made to establish if any further equipment needs to be isolated to ensure that the work may be carried out in safety and arrangements made accordingly.

3.4 Work near exposed live HV conductors and on or near exposed live low and extra low voltage conductors

Electricity at Work Regulation 14 refers.



Note 1: The requirements for working near exposed live conductors may under certain circumstances be extended to permit work on exposed live low and extra low voltage conductors. The principles described in Section 3.4 are defined to cover both situations with specific reference where needed to any additional requirements for work on live conductors.

Note 2: This section deals specifically with “Live Working” and is not aimed at work activities that are not generally of an electrical nature, e.g. excavation by civil works contractors in the vicinity of power cables. For such work activities, refer to Section 3.7.

3.4.1 Work on or near exposed live conductors shall not normally be permitted. Before instituting such work an assessment shall be made by the Line Manager of the level 3 competent person for the assets concerned to establish whether the work can be achieved under dead working conditions. If after assessment of all the circumstances and risks involved it is decided that work has to be carried out on low voltage or extra low voltage conductors or near exposed live conductors then the following shall be observed.

3.4.1.1 No person shall be engaged in any work activity so near or on any exposed live conductor that danger may arise unless:

- a) It is unreasonable in all the circumstances for the conductor to be dead (Condition 1), and
- b) it is reasonable in all the circumstances for the person to be at work near or on the conductor while it is live (Condition 2), and
- c) suitable precautions, including where necessary the provision of suitable protective equipment, are taken to prevent injury (Condition 3).

3.4.1.2 ALL THREE CONDITIONS (1,2 and 3) shall be satisfied and the justification for working near or on exposed live conductors together with the precautions to be taken shall be authorised and formally recorded before such work activity is allowed to commence.

3.4.2 The Need for Exposed Conductors to be Live (Condition 1)

3.4.2.1 It is always preferable for safety reasons that work near or on exposed conductors should be carried out under dead conditions. In all circumstances preference shall be given to working under dead conditions.

3.4.2.2 In assessing whether it is justifiable for work to proceed all relevant factors shall be taken into account. Relevant factors include:

- a) when it is not practicable to carry out the work with the conductors dead, e.g. where for the purpose of testing it is necessary for the conductors to be live;
- b) the creation of other hazards, by making the conductors dead, such as to other users of the system, or for continuously operating process plant etc;
- c) the need to comply with other statutory requirements;
- d) the level of risk involved in working near or on exposed live conductors and the effectiveness of the precautions available (See also Condition 3) set against economic need to perform that work.