



LEIA Safety Information Sheet

Electrical Working

Prepared by the LEIA Safety and Environment Committee

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PREAMBLE

This Information Sheet is one of a series produced by the LEIA Safety and Environment Committee on topics relevant to the Lift and Escalator Industry. Whilst every effort has been taken in the production of these sheets, it must be acknowledged that they should be read in conjunction with the relevant legislation, codes of practice etc. They should not be taken as an authoritative interpretation of the law but guidance to it.

INTRODUCTION

Information is included to give guidance on aspects of live working that needs to be considered when devising a safe system of work for those working on or near electrical equipment. It is appreciated that some companies will already have procedures or guidance for safe working, they should nevertheless check that all aspects addressed in this Information Sheet are covered.

This Information Sheet incorporates Safety Information Sheet 42 Electrical Isolation Including Lock Off and Tag Out which is withdrawn.

HAZARDS

On average, each year in the UK about 28¹ people die from electric shock or electric burns at work, many of which are preventable. Although only a few serious electrical accidents occur in the lift and escalator industry each year, there is an absolute requirement in law that precautions are taken to prevent injury from live electricity. Other hazards exist where electrical arcing occurs as a result of an accidental short circuit, the heat it generates can be intense and can cause deep seated and slow healing burns. People working on or near live equipment often fail to appreciate the very real risk of injury which can arise from this arcing.

Safe Systems

The LEIA Safety Charter requires electrical isolation and locking off when power is not required and when working close to unguarded machinery.

The safest system of work on or near electrical equipment is to carry it out with the electrical power isolated. Care should be taken that all sources of electricity have been identified and “Lock Off and Tag Out” procedures have been used to secure all the sources from inadvertent re-energising See Locking Off and Tagging Out Power [LOTO] below). However, there may be circumstances where having the electrical supply switched off is not practicable due to the nature of the work e.g. testing, fault diagnosis. In these circumstances, once the test has been completed or the fault has been found, the equipment should be isolated and secured from reconnection before the work continues. Where working with ‘live’ equipment is considered absolutely necessary, care must be taken on the way the work is carried out. There is a legal requirement for risk assessment to be carried out to identify a safe system of work for persons undertaking work on live electrical equipment to ensure there is no danger of injury.

Legal Requirements

The Health and Safety at Work etc. Act 1974 sets out the general health and safety duties of employers, employees and the self-employed.

The Management of Health & Safety at Work Regulations 1999 require that every employer shall make a suitable and sufficient assessment of the risks to the health and safety of employee and those not in his employ, to ensure measures are taken to comply with the legal requirements.

The Electricity at Work Regulations 1989 requires precautions to be taken against the risk of death or personal injury from electrical work activities.

¹ Source HSE Website <http://www.hse.gov.uk/statistics/causini/kinds-of-accident.pdf>

Regulation 14 requires that 'no person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulation material so as to prevent danger) that danger may arise unless:-

- It is unreasonable in all circumstances for it to be dead, and
- It is reasonable in all circumstances for him to be at work on or near it whilst it is live, and
- Suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

All three qualifications must be met.

Insulation, Protection and Placing of Conductors

All conductors in a system which may give rise to danger shall either:-

- a) be suitably covered with insulating material and as necessary protected so as to prevent, so far as is reasonably practicable, danger; or
- b) have such precautions taken in respect of them (including, where appropriate, their being suitably placed) as will prevent, so far as is reasonably practicable, danger.

Electrical Equipment

Much can be done to improve safety by looking at the design and selection of electrical equipment. New equipment should be designed and constructed, so far as is reasonably practicable, to ensure that it does not present the risk of electrical shock or burn.

As an example, the design of lift controllers can avoid hazards by using 'finger proof' connections etc. Isolators should have the facility for a system of securing the isolator in the off position by use of locking devices to meet the requirements of the Regulations.

It is recognised, however, that there is equipment, particularly on older equipment, where the risk from electrical shock or burns relies on the person working having sufficient knowledge and experience to recognise the danger and how to avoid it. Exposed conductors need to be assessed to identify if protection is required eg insulating covers, to prevent accidental contact when a person is near the equipment. At the very least, warning signs must be displayed.

If electrical covers are removed temporarily it is important that they are replaced as soon as possible to prevent inadvertent contact with live conductors. However, it must be clearly understood that the expectation is that when work is being undertaken, the equipment has been isolated from the power source.

Assessment Procedure

Most electrical accidents occur because individuals are working on or near equipment which is thought to be dead but which is in fact live. It is important that the circuits or equipment to be worked on is thoroughly assessed to ensure safe working.

Whenever any work is undertaken it must be stressed that working with the equipment isolated including any other exposed conductors in the work area is the expected system of work. However, if live working is essential all three conditions of Regulation 14 of the Electricity at Work Regulations 1989 have to be satisfied.

It should be remembered before working on equipment made dead that all possible sources must be proven to be so by using appropriate equipment i.e. a suitable test device. The test device should be confirmed to be working on a known live source or proving unit before and after use. There may be circumstances where to make equipment dead is impracticable. For example, it may be difficult, if not impossible, to fault find without the equipment being energised at some time. Also, it may not be realistic to monitor the operation and performance of a control system with it dead.

Whenever any work is undertaken it must be stressed that working with the equipment isolated including any other exposed conductors in the work area is the expected system of work

In these circumstances, prior to commencing work, a risk assessment must be carried out on the specific equipment to be worked on. The person carrying out the assessment should be adequately trained and knowledgeable on the equipment involved.

The outcome of the risk assessment must be whether it is reasonable in all circumstances to work live and whether the person needs to be at work on or near it. If live working is considered essential then precautions must be taken to prevent injury - this is an absolute legal requirement.

Live working can only be justified if suitable precautions are taken to prevent injury arising from the risks identified in the assessment. The following should be amongst the precautions taken:-

- Those undertaking the work must be adequately trained and experienced in the type of live working being undertaken. They should be able to recognise their own limitations and have the ability to seek assistance with work which may be outside their area of competence.
- Removing the possibility of touching un-insulated terminals by installing temporary insulation or protective barriers. This may mean putting temporary insulation over live parts and/or applying insulation to parts which are at earth potential.
- Disconnect and use Lock Off & Tag Out equipment to isolate and secure power sources not required.
- Refer to wiring diagrams (these should be available – if not contact the equipment manufacturer who should make them available in accordance with LEIA policy)
- Use rubber mats in the front and rear of control panels.
- When working live, it is most important to prevent non authorised personnel entering the area where live work is being undertaken. Warning notices should be fixed to the enclosures or barriers used.
- For live working, only properly insulated tools should be used. They should have insulation which is robust enough not to be damaged. The tools will require regular inspection by a competent person.
- Test device probes should only have a very limited amount of un-insulated tip exposed i.e. no more than 3 mm. The test device should be checked before and after use to ensure it is working correctly.
- Protective clothing and PPE equipment should be provided and used as required where this reduces the risk of contact with live parts or earth e.g. electrical insulating gloves to the correct level of protection.
- The HSE recommends that there should be at least 915mm (3 feet) clear working space from parts live at 415 volts. The space should be increased to at least 1375mm (4ft, 6inches) if there are parts live on both sides. It is common practice that most lift control equipment is enclosed within a cabinet, therefore one set of facing doors should be closed to remove the hazard of exposed live equipment both sides.
- If live electrical work is considered necessary e.g. fault finding, then the electrical supply should be disconnected and secured as soon as it is not required, e.g. the fault identified and the repair/replacement work is to be commenced.

- When these recommendations cannot be complied with, other equivalent means of safety should be adopted in order to satisfy the requirements of the Electricity at Work Regulations 1989.

Safe working practices rely on clear thorough systems of work, carried out by competent and trained personnel who are self-disciplined and aware of their own limitations. The risk assessment should consider how an injury/accident may occur and whether a person carrying out work should be accompanied. If an accompanying person can contribute towards the implementation of safe working, then this should be considered.

If live electrical work is considered necessary, then the electrical supply should be disconnected and secured as soon as it is not required

System of Work

There should be a system of rules and procedures wherever live electrical work is to be carried out. The LEIA Safety Charter states

“Electrically isolate and lock off when power is not required and when working close to unguarded machinery”.

Company rules should reflect this requirement and be included in all work practices in a format readily available and understood. If something totally unexpected occurs during the working procedure, there must be a review of the work (i.e. a further risk assessment). Those working should understand the correct working methods related to the specific work in hand. The people doing the work should be aware of the limits of the work they are to do and the constraints put upon them as to how they carry out the work. This includes knowing how to deal with any contingencies which may arise.

All work must be planned properly and the person supplied with appropriate information, tools, instruments, safety equipment and instructions.

Supervision of Work

Regular and systematic management checks of the work are necessary for all work carried out in the field but this is especially important for those undertaking live electrical work.

Please see attached diagram “Live Working Flow Chart” used for the assessment procedure for safe working practices working on dead or live equipment.

Locking Off and Tagging Out Power [LOTO]

For work on electrical equipment or circuits, it is important to ensure that the correct point of isolation is identified, an appropriate means of isolation is used and that the supply cannot inadvertently be reinstated while the work is in progress. Caution notices should also be applied at the point(s) of isolation, and the conductors must be proved to be dead at the point of work before they are touched.

A fundamental principle is that the point of isolation should be under the control of the person[s] carrying out the work on or near the isolated conductors.

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The isolation device must be in a suitable location with safe access to it and state its ON/OFF position and identify the equipment it controls. However, it could be a plug and socket, circuit breaker, fuse etc, as appropriate.

The circuit or equipment to be worked on should be securely isolated by one of the following methods.

- Isolation using a main switch or distribution board (DB) switch-disconnector
- Isolation of individual circuits
 - Isolation of individual circuits protected by circuit breakers
 - Isolation of individual circuits protected by fuses

To ensure effective isolation of the electrical supply, the electrical equipment should have a locking off facility or other means of securing the isolator in the OFF position.

Following isolation, secure the equipment or circuits by applying a lock or other securing device. Before starting work, it should be confirmed that the parts to be worked on are dead. Never assume that equipment is dead because a particular isolation device has been placed in the off position. The procedure for proving dead should be by use of a proprietary test device, non-contact voltage indicators* etc. It is recommended that multimeters should not be used. The test device should be proved to be working on a known live source or proving unit before and after use. All phases of the supply and the neutral should be tested and proved dead.

**Safe electrical working practice requires the use of non-contact voltage indicators to verify electrical isolation of power between the isolator switch and the controller prior to its removal from the truss. The use of the non-contact voltage indicator is restricted to this specific escalator task. All other validations of zero electrical energy state must be verified with a proprietary test device.*

Where a number of people are working on a system, the use of multiple Lock Off Tag Out device (see Figure 1) may be appropriate, ensuring each individual applies their own lock to ensure the switch cannot be operated without their knowledge and that before the equipment can be re-energised they remove their own personal lock.

Checks must be carried out at the point of work in order to prove the equipment and other conductors near the point of work are dead. For a three-phase supply, all supply conductors must be checked to ensure the disconnection has been achieved.

Consideration must be given to all sources of electrical energy that could remain live in the work area. These must also be isolated and secured if possible; otherwise precautions must be taken to prevent danger.



Figure 1 Example of Multiple Lock Off / Tag Out Device

REFERENCES

Electricity at Work Regulations 1989 - ISBN No 0-11-096635-X.

Available from <http://www.legislation.gov.uk/>

HSR25 - Memorandum of Guidance on the Electricity at Work Regulations 1989 HSE - ISBN 978-0-7176-6228-9

<http://www.hse.gov.uk/pubns/books/hsr25.htm>

HSG85 - Electricity at Work - Safe Working Practices, HSE - ISBN 0-7176-2164.2

<http://www.hse.gov.uk/pubns/books/hsg85.htm>

GS38 Electrical Test Equipment for use on Low Voltage Electrical Systems, HSE - ISBN 978 0 7176 0845 4.

<http://www.hse.gov.uk/pubns/books/gs38.htm>

BS 7255 - Code of Practice for Safe Working on Lifts BSI.

<https://shop.bsigroup.com/>

See also LEIA Safety Charter and 'Safety Training Presentation N° 3 – Electrically isolate and lock off'

<https://www.leia.co.uk/safety/safety-charter/>

For any clarification of this Information Sheet contact your Safety Advisor or the LEIA Safety and Training Manager.

APPENDIX 1 LIVE WORKING FLOWCHART

