

## Facilities, Residential and Commercial Services

## Document – Standard Operational Procedure

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**Title**                    **Electrical Safety Rules for Low Voltage Systems**

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**Facilities Management****Document – Standard Operational Procedure**

<b>Title</b>	Management of Low Voltage Switch rooms at the Main Campus, Brownlow Hill
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<b>Scope</b>	Internal and External.
<b>Audience</b>	Estates Management, Capital Project and Estates Strategy, Computer Services Department, Consultants & Contractors

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# 1. Introduction

The University of Liverpool (the University) has a duty under Health and Safety at Work legislation to prepare and issue a general policy statement on health and safety at work, including the organisation and arrangements for carrying out that policy. For particular work or activities, special rules, related documents and procedures are necessary in support of these policy statements. These 'Electrical Safety Rules for Low Voltage Systems' hereinafter abbreviated to "these Rules" are used to cover work and activities associated with Low Voltage Systems and equipment at premises managed by the University. These Rules are intended as a guide to safe working for employees when they are required to work on or near the electrical equipment at the managed premises.

## 1.1 *Scope and application of these Rules*

These Rules Shall be applied to:

(a) Low Voltage Switchrooms (including those located in Substations), all external electrical distribution services (excepting those provided by the utility companies) including mains supplies, ups/battery supplies, lightning Conductors, general and special earthing, lighting of roadways, car parks, cycle and pedestrian ways.

(b) The electrical distribution installation within buildings where the University has control of the Danger. For multiphase installations, this includes all works up to and including the isolator and in single phase installations, this includes all works up to and including the distribution boards also all Final Circuits up to and including socket outlets, fused spurs, ceiling or wall lighting terminations.

## 1.2 *Other related documents and procedures*

In order to assist in the application of these Rules, Standard Operating Procedures issued by University Shall be complied with in accordance with University instructions. Although the Standard Operating Procedures associated with these Rules are not, in themselves, individual electrical safety rules for Low Voltage Systems, they shall be read in conjunction with the rules to which they relate and form important supporting information for the implementation of these Rules.

Where University employees are required to work near electrical installations and associated electrical equipment not owned or controlled by the University, these Rules and related procedures shall be used as a guide to safe working practice.

## 1.3 *Issue of these Rules*

A copy of these Rules and, as appropriate, related documents and procedures Shall be issued to such employees of the University and such other persons as determined by the Authorising Engineer. Such employees and other persons Shall sign a receipt for a copy of these Rules, related documents and procedures (plus any amendments) and Shall keep them in good condition and have them available for reference as necessary when work in being carried out under these Rules.

## **1.4 Variation of these Rules**

In exceptional or special circumstances these Rules may be varied to such an extent as is necessary and Approved by the Authorising Engineer. Such variation Shall always be in writing and Shall ensure, as far as reasonably practicable, that safety requirements are satisfied in some other way.

## **1.5 Definitions**

Terms printed in initial capitals in these Rules are defined terms.

### **Approved**

Of a type sanctioned for use by the University.

### **Danger**

Risk of injury or death from electricity.

### **Dead**

At or about zero voltage and disconnected from any Live System.

### **Conductor**

A Conductor of electrical energy

### **Final Circuit**

An electrical circuit that feeds individual equipment or groups of equipment used within a building e.g. a lighting circuit.

### **Isolate**

Disconnect and separate electrical equipment from every source of electrical energy in such a way that this disconnection and separation is secure.

### **Isolation Diagram**

A diagram attached to the Electrical Permit-to-Work illustrating the safety measures taken.

### **Live**

The presence of an electrical potential and/or electrically charged or from connection to a System.

### **Personnel**

#### **Engineering Maintenance Manager**

A suitably qualified engineer appointed in writing by the Director of Estates to take responsibility for the effective management of these Rules.

#### **Authorised Person (AP)**

A Competent Person appointed in writing, by the Engineering Maintenance Manager, in accordance with these Rules, to be responsible for the implementation of these Rules, in respect of the operation of defined Systems.

#### **Competent Person (CP)**

A suitably trained person (normally an Electrical Technician) who has sufficient technical knowledge and/or experience to avoid any Danger and has sufficient knowledge of these Rules and has the necessary competencies to carry out specific work activities on the types of installations, equipment and locations indicated on their Electrical Permit-to-Work or certificate of appointment.

#### **Accompanying Safety Person**

A person not directly involved in the work or test, who has received Emergency First Aid training and who has adequate knowledge, experience and ability to avoid Danger, keep watch, prevent interruption, apply First Aid and summon help.

### **Main Low Voltage Switchboard**

A Low Voltage switchboard that is used for electrical distribution purposes and is connected directly to a High/Low Voltage transformer.



## **Safety Document**

**Limited Work Certificate** – A written authority issued by an Authorised Person for specified tasks to be undertaken in an area or location which is under the control of an Authorised Person for electrical safety reasons, and for which an Electrical Permit-to-Work is not appropriate.

### **Electrical Permit-to-Work**

A written statement, issued by an Authorised Person to a person competent for the task to be undertaken. The document confirms to the recipient that an item of electrical equipment has been securely isolated from all sources of electrical supply.

## **Safety Lock**

A unique padlock having a single key that differs from all other keys provided for the System and used for securing a means of isolation.

## **Safety Signs**

### **Caution Sign**

A temporary non-metallic sign bearing the words "Caution – Do Not Interfere with This Equipment" which also has appropriate graphical symbols. The sign is to be suspended on a non-metallic cord.

### **Danger Sign**

A temporary, non-metallic sign bearing the words "Danger Live Equipment" to be used where there is adjacent Live equipment at the place of work which also has appropriate graphical symbols. The sign is to be suspended on a non-metallic cord.

## **Shall**

Where Shall is used in these Rules with no qualification, this indicates a mandatory requirement with no discretion permitted and no judgement made.

### **“Shall where practicable”**

When Shall is qualified only by “where practicable”, a slightly less strict standard is imposed. It means that where it is possible to achieve the aim, in the light of current knowledge and invention, but bearing in mind the hazards associated with the work or testing to be undertaken, then the requirement must be met. There is no allowance to avoid the requirement on the grounds of difficulty, inconvenience or cost.

### **“Shall where reasonably practicable”**

When Shall is qualified by “where reasonably practicable”, then a judgement is to be made as to what is reasonable, balancing the magnitude of the risk against the cost, time and trouble or effort necessary for averting the risk.

## **Substation**

Any premises, or part thereof, which contains equipment for transforming or converting electricity to or from High Voltage (other than transforming or converting it solely for the operation of switching devices or instruments) or equipment for switching, controlling or regulating electricity at High Voltage.

## **Supervision**

**Personal Supervision** is given by a person having adequate technical knowledge and experience who is all times during the course of the work or testing in the presence of the person being supervised

**Immediate Supervision** is given by a person having adequate technical knowledge and experience who is continuously available at the location where work or testing is in progress and who attends the work area as is necessary for the safer performance of the work or testing.

## **Switchroom**

A secure room, the primary purpose of which is to provide accommodation for a Low Voltage Switchboard(s).

## **System**

Items of electrical plant and equipment which are connected to a common source of electrical energy.

## **University**

For the purposes of these rules, the University is the University of Liverpool.

## **Voltage Ranges**

**Extra Low Voltage (ELV)** - A potential not exceeding 50 volts A.C. or 120 volts D.C., whether between Conductors or to earth.

**Low Voltage (LV)** - A potential not exceeding 1000 volts A.C or 1500 volts D.C. between Conductors or 600 volts A.C. or 900 volts D.C. between a Conductor and earth.

**High Voltage (HV)** - A potential normally exceeding Low Voltage.

## **2. Standards**

### **2.1 *University safety, health and environmental management system***

These Rules form part of the University's Site Safety Management System that contains amongst other items, specific management procedures and codes of practice that relate directly to the application of these Rules. The Site Safety Management System details the policies, processes, procedures and other documents, which together, form a safety management system based on risk management principles for the safe operation of Low Voltage Systems.

Documents in the Site Safety Management System also provide additional guidance and support the application and use of these Rules and they should be read and used in conjunction with these Rules. The current version of the documents contained in the Site Safety Management System can be found in the University's document control system.

### **2.2 *Policy on electrical safety***

There is a legal obligation on all persons involved with the operation of, or working on electrical equipment to carry out their work in such a way as to prevent Danger and injury to themselves and/or others. These Rules have been put in place to assist in carrying out those obligations. It is the aim of the University to install, maintain and operate a Low Voltage Systems and installations to the highest safety standards and electrical equipment that is installed on the University's premises Shall be suitable for the task it is intended to perform and the environment within which it will be expected to work.

### **2.3 *Planning***

It is essential that equipment, machinery or installations are prepared for the work that is to be carried out. This includes the isolation and release of all sources of energy (electrical, mechanical, hydraulic, pneumatic, etc.), and may also involve additional work such as decontamination or the construction of a safe working platform. The isolation of energy sources Shall be secure in that energy cannot be inadvertently re-introduced into the equipment, machinery or installation.

All electrical work Shall be the subject of a suitable and sufficient risk assessment process which is comprised of two parts. The first part is a formal risk assessment that has been carried out by the University and is recorded in the University's document control system. The second part is a dynamic risk assessment that the person carrying out the electrical work Shall carry out prior to commencing the work to account for all local issues. These Rules constitute a control measure to manage the hazards identified in the risk assessment process.

The work Shall be thoroughly planned and adequately resourced so that it can be so far as is reasonably practicable, executed safely and that the completed installation or equipment is and remains safe. Particular care Shall be taken when working on equipment that is safety related such as equipment in a potentially explosive atmosphere, or which guards against contact with moving machinery.

Care Shall be taken to ensure that any maintenance or repair will not hinder or prevent the correct operation of the equipment or adversely affect its safety or the safe operation of the equipment in any way.

## **2.4 Competence**

Persons who work on the University's Low Voltage Systems and installations and the buildings that contain them Shall be competent to carry out such work. The level of competence required to do a task is dependent upon the complexity of that task and the amount of knowledge required. Assessing the suitability of an individual to do a task requires establishing evidence of:

- (a) Training to an appropriate level in the type of work and area of work.
- (b) Experience of achieving a suitable standard in the type of work.
- (c) Familiarity with the System to be worked upon.
- (d) The possession of adequate and appropriate resources.
- (e) Regular re-assessment and routine auditing.

Individuals and organisations who cannot demonstrate competence will not be allowed to work on the University's Low Voltage Systems and installations unless they are under Personal Supervision.

These Rules provide information on competence which has been taken from the "Memorandum of Guidance on the Electricity at Work Regulations 1989" HSR25 published by the HSE.

## **2.5 Risk Management**

Undertaking work or testing on LV equipment creates the potential for danger to persons carrying out the activity. To minimise the risk to an acceptable level requires the application of appropriate policy, processes and procedures including application of these Rules and the use of appropriate Personal Protective Equipment (PPE).

The main Danger to persons carrying out work on LV equipment are electric shock, burns, falls or other injury arising from:-

- (a) Disruptive failure of the LV equipment.
- (b) Operation of the incorrect LV equipment leading to dangerous conditions.
- (c) Contact with energised LV Conductors.
- (d) Inadvertent operation of stored energy devices such as springs and hydraulic pressure.
- (e) Operation of LV equipment unfamiliar to the operator.

Although these Rules form part of the University's policy for work on the University's Low Voltage Systems, they are not sufficient on their own to provide a complete safe system of work; rather they address safety of the individual from hazards inherent within the Low Voltage System.

Additional precautions will be required in any specific circumstance to address danger arising from the working environment and not associated with the Low Voltage System. Such precautions should be arrived at following an assessment of the risks in any particular circumstance. These will be covered by the application of risk management methodology. The detailed risk assessments and the resulting outputs are detailed in Site Safety Management System Procedure on Risk Management.

Employees, whilst at work, are required to take reasonable care to avoid injury to themselves and others by their work activities and to cooperate with the University in meeting statutory requirements.

## **3 Duties and Roles of Personnel**

### **3.1 Duties**

**Extract from Regulation 3 of the Electricity at Work Regulations 1989:-**

*“(1) It Shall be the duty of every employer and self-employed person to comply with the provisions of these regulations in so far as they relate to matters which are within their control.*

*(2) It Shall be the duty of every employee while at work:*

- (a) To co-operate with his employer so far as is necessary to enable any duty placed upon that employer by the provisions of these regulations to be complied with; and*
- (b) To comply with the provisions of these regulations in so far as they relate to matters which are within his control.”*

The following sections describe how various persons will fulfil the above duties and other responsibilities in respect of these Rules.

### **3.2 Vice Chancellor (VC)**

The VC Shall ensure that the duty of the employer as described in the Electricity at Work Regulations 1989 are fulfilled in relation to these Rules. The VC Shall be responsible for ensuring that adequate resources are available to enable the effective operation of these Rules and Standard Operating Procedures.

### **3.3 Responsible Person (Low Voltage) - Deputy Vice Chancellor (DVC)**

The DVC:

- (a) Has overall accountability for ensuring legal compliance for the general management and control of any Low Voltage electrical works within the University for which it has responsibility.
- (b) Is accountable for ensuring that adequate resources are made available to enable the effective operation of these Rules and Standard Operating Procedures.

### **3.4 Deputy Responsible Person (Low Voltage) - Director of Facilities, Residential and Commercial Services (FRCS)**

The Director of FRCS:

- (a) Will inform the Responsible Person of any strategic and operational risks using the University strategic and operational risk register.
- (b) Will obtain resources for electrical compliance from the Responsible Person to support assets being maintained with reasonable skill and care.

### **3.5 Assistant Responsible Person - Director of Estates Management**

The Director of Estates Management:

- (a) Will inform the Deputy Responsible Person of any electrical strategic and operational risks which we be raised by using the University strategic and operational risk register.
- (b) Obtain resource for electrical compliance from the Deputy responsible person to support assets which are being maintained with reasonable skill and care.
- (c) Will seek to ensure that appropriate electrical engineering training is undertaken for

- the Estate Management team.
- (d) Will validate any proposed changes to electrical operations via approving and signing off Estates Management policies.

### **3.6 Engineering Maintenance Manager**

The Engineering Maintenance Manager:

- (a) Is appointed by the Assistant Responsible Person and to act as the day to day budget holder responsible for maintenance and safety of the University's Low Voltage Systems and installations and has most influence on the implementation and operation of electrical safety policy and guidance with regard to work on, or the testing of, defined electrical equipment.
- (b) Has operational responsibility for the operation and management of the University's Low Voltage Systems and installations and is required by the Health and Safety at Work Act 1974 and the Electricity at Work Regulations 1989 to prepare and issue policy statements on health and safety at work.
- (c) Will inform the Assistant Responsible Person of any strategic and operational risks associated with the Low Voltage Systems and installations using the University's strategic and operational risk register.
- (d) Will obtain resources for electrical compliance from the Assistant Responsible Person to support assets being maintained with reasonable skill and care.
- (e) Will validate proposed changes to Low Voltage electrical operations via reviewing and making recommendations to the health and safety committee for approval for any new and or existing electrical safety policies.
- (f) Will provide a copy of these Rules to all contract managers engaged in electrical projects and obtain verification from the project managers that all contract staff engaged in electrical works are competent, suitably qualified, and have the relevant qualifications to carry out the works described in the specification of works for the project.
- (g) Will appoint in writing an Authorising Engineer (AE) for all Low Voltage Systems and installations within the remit of the Director of Estates.
- (h) Will ensure that appropriate electrical engineering training for the engineering maintenance team is identified with the assistance of the AE and is planned and delivered.
- (i) Will review the recommendations of the AE who is responsible that any prospective AP meets the requirements of these Rules and who will issue to each AP a certificate of appointment valid for a period not exceeding three years together with a personal copy of these Rules.
- (j) Will in consultation with the AE, if necessary, suspend the appointment of an AP by withdrawing their certificate of appointment.
- (k) Will report to the Assistant Responsible Person any deficiency in the number of suitably trained and experienced APs that significantly impairs the ability of the University to provide a safe and effective service.
- (l) Will arrange the AE audit for the performance and record the operational experience of each AP at twelve monthly intervals.
- (m) Will review the AE's appointment annually and ensure that the AE's recommendations have been implemented.

### **3.7 The Authorising Engineer**

The Authorising Engineer (AE) Shall be responsible for advising on the implementation and administration of these Rules, and Shall monitor and audit the application of these Rules.

The AE Shall be responsible for the validation of training and qualifications of any Authorised Persons wishing to work on the University's Low Voltage Systems.

The AE is to recommend to the Engineering Maintenance Manager, persons for appointment or re-appointment as Authorised Persons and Shall maintain a register of all Authorised

Persons.

The AE Shall be satisfied that each prospective Authorised Person meets the requirements of these Rules and is to arrange the issue to each Authorised Person a certificate of appointment valid for a period not exceeding three years.

The AE is to define in writing, using drawings and diagrams if considered appropriate, the extent of the System and installation for which each Authorised Person is to be responsible and is to issue a personal copy of these Rules to each Authorised Person.

The AE Shall:-

- (a) If necessary, recommend to the Engineering Maintenance Manager the suspension of the appointment of Authorised Persons by withdrawing their certificate of appointment.
- (b) Report any deficiency in the number of suitably trained and experienced Authorised Persons that significantly impairs the University's ability to provide a safe and effective service.
- (c) Audit the performance and record the operational experience of each Authorised Person at twelve monthly intervals.
- (d) At intervals not exceeding three years, undertake comprehensive audits of the application of these Rules to all Low Voltage Systems and installations and review each Authorised Person's operational experience.
- (e) Ensure, as far as reasonably practicable, that a system is in place to circulate relevant information on Operational Restrictions and Dangerous Occurrences to all Authorised Persons.
- (f) Agree in writing any local deviation from these Rules that may be necessary for their application to a particular item of equipment or location before the deviation is applied.
- (g) Ensure, as far as reasonably practicable, that any amendments to these Rules are brought to the attention of, and understood by, all Authorised Persons.

### **3.8 Authorised Person**

The duties of an Authorised Person (AP) Shall be by agreement with the Engineering Maintenance Manager and may include the following-

- (a) To have an adequate knowledge of these rules and those regulations and documents listed in Appendix 1.
- (b) The issue and cancelation of Limited Work Certificates and Electrical Permits-to-Work.
- (c) To ensure that all relevant records are kept up to date.

### **3.9 Competent Person**

A Competent Person (CP) is a person issued with a certificate of appointment by an Authorised Person, possessing the necessary technical knowledge, skill and experience relevant to defined work, to enable them to undertake such work in a safer manner.

A CP is to have an adequate knowledge of these Rules and of those regulations and documents listed in Appendix 1.

A CP may receive and clear Safety Documents.

A CP authorised by the issue of a Safety Document may only undertake or supervise the work specified until the task is complete and the CP has signed Part 3 of the original card page of the Safety Document. Neither the CP, nor any person under the direct control of the CP is to attempt to undertake any other duties. If the CP is in receipt of a Safety Document and has to leave the location of the work, such work may continue in his absence.

Electrical Technicians are Competent Persons employed by the University, who will assist the Authorised Persons in the effective control and management of the Low Voltage System and installations. Their accountability relates to the safe condition and operation of electrical equipment in individual buildings. They Shall report any concerns and recommendations to the Authorised Person who may in turn escalate them to the Engineering Maintenance Manager if thought necessary.

### **3.10 Accompanying Safety Persons**

An Accompanying Safety Person Shall be in attendance when he can substantially contribute to safe working practice and where the CP responsible for the work believes there are special risks when working alone. Examples of this are:

- (a) When equipment cannot be confirmed Dead until the CP has made Conductors accessible.
- (b) When working or testing in accordance with Table LV1, when the means of isolation is not positively identified.
- (c) A CP working on or near bare live Conductors where the CP working on his own would not be capable of undertaking the work safely without assistance in keeping other people from the work area.

In addition, the CP responsible for the work may require an Accompanying Safety Person to be in attendance when he considers that the circumstances merit such attendance. Issues to be considered include:

- Is there a safe way in and a way out of the work place for one person? Can any temporary access equipment which is necessary, such as portable ladders or trestles, be safely handled by one person?
- Can all the plant, substances and goods involved in the work be safely handled by one person? Consider whether the work involves lifting objects too large for one person or whether more than one person is needed to operate essential controls for the safe running of equipment.
- Is there a risk of violence?



## **4 General Precautions**

### **4.1 *Right to object***

When any person receives instructions regarding work or testing on or near, or the operation of Low Voltage equipment, they Shall report any objections they may have to the carrying out of such instructions to the person issuing them, who Shall then have the matter investigated and if necessary referred to a higher authority.

### **4.2 *General***

Equipment that is considered by an AP to be in a dangerous condition Shall be disconnected elsewhere and action taken to prevent it from being re-energised. Details of the incident and the actions taken Shall be reported as soon as is reasonably practicable to the Engineering Maintenance Manager.

If the work involves, or may involve, obtaining access to items of equipment over which confusion could occur, the AP Shall identify such items to the CP and apply temporary marking to such equipment.

The making of electrical equipment and/or circuit Conductors Dead or Live by means of a signal or pre-arranged understanding after an agreed interval of time is forbidden.

### **4.3 *Security and admittance to Switchrooms***

The University's Low Voltage Systems can be operated in an interconnected manner and most Main LV Switchboards can use this facility to provide enhanced electrical supply resilience. The LV interconnecting circuits are operated normally with the circuit energised from one end and the switch-fuse at the other end open. Some of the existing switchgear does not have castell interlocks and therefore the security of Switchrooms is crucial to the operation and safety management of the Low Voltage System.

Any entrance to a Switchroom Shall be kept closed and securely locked when the equipment is unattended. The locks used Shall to be such that a single key (or electronic device) will enable access to be gained to any switchroom over which the Authorised Person (LV) has control or a degree of control on a site.

Information and guidance on access to switchrooms can be obtained in the Standard Operating Procedure "Management of Access to Low Voltage Switchrooms at the Main Campus, Brownlow Hill".

Equipment, other than items required for the operation and maintenance of the installed switchgear, Shall not be stored in a Switchroom. The AP Shall not permit Switchrooms to be used a route for other services, materials and equipment which may compromise safety or put at risk than business continuity of the University buildings and systems e.g. services, water, drainage, medical gases, methane, storage of materials, other systems.

### **4.4 *Portable fire protection equipment***

Only CO<sub>2</sub> or dry powder extinguishers Shall be used in the vicinity of Live electrical equipment.

After the discharge of portable extinguishers in an enclosed space, personnel Shall withdraw from that space and report the incident to the Engineering Maintenance Manager. The used

portable extinguishers Shall then be replaced with serviceable portable extinguishers.

After any explosion or fire, or after the discharge of extinguishers in an enclosed space, the space Shall be thoroughly ventilated before entry of personnel, unless suitable breathing apparatus is worn.

#### **4.5 Display of temporary Safety Signs**

##### **Caution Signs**

Caution Signs are to be prominently displayed and securely fixed at all points of isolation before the start of, and for the duration of, any work or testing, and before the issue of any Electrical Permit-to-Work.

##### **Danger Signs**

Danger Signs Shall be prominently displayed on any equipment which remains Live and is adjacent to equipment to be worked on or tested before the start of, and for the duration of the work or testing, and before the issue of any Safety Document.

Where work or testing is to be undertaken on any part of a multi-panel switchboard, Danger Signs Shall be prominently displayed on the panels or compartments adjacent to the part being worked on or tested which remain Live . If the board has rear access, Danger Signs are to be similarly displayed at both the front and rear of the board. Reliance is not to be placed upon the switchboard labelling when identifying parts at the rear of the board. Any discrepancies found Shall be reported to the AP in charge of the work.

#### **4.6 Dangerous Occurrences and Near Misses**

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1995, requires certain dangerous occurrences and accidents to be reported to the Enforcing Authority (HSE).

A dangerous occurrence or near miss Shall be reported immediately by the CP or AP witnessing it, or being informed of it, to the Engineering Maintenance Manager and the FRCS Health and Safety Manager.

The AP Shall, as soon as reasonably practicable, send a preliminary written report of the dangerous occurrence or near miss to the Authorising Engineer, Engineering Maintenance Manager and Assistant Responsible Person.

The Authorising Engineer Shall investigate each dangerous occurrence and issue a report to the Engineering Maintenance Manager and the Assistant Responsible Person. The report is to be sufficiently detailed to enable the sequence of events leading to the occurrence to be determined. Where reasonably practicable, the report is to include photographs taken before any items of equipment involved in the dangerous occurrence are disturbed.

Any notifications and reports required to satisfy statutory or other management requirements Shall be issued by the Engineering Maintenance Manager.

#### **4.7 Personal Protective Equipment (PPE)**

Appropriate PPE Shall be provided by the University and it Shall be readily available at all times to those who need it. It Shall be worn or used whenever necessary to avoid Danger and injury and as required by these Rules.

Only PPE suitable for purpose Shall be provided by the University and its contractors and PPE provided for a CP employed by a contractor may be used if the AP agrees. Such use Shall be recorded on the Safety Document issued.

PPE Shall be inspected by the user for visible defects before and after use and any suspect item Shall not be used. Suspect items Shall be reported to the AP who is to consider its withdrawal and replacement.

Unless more frequent intervals are specified, an AP is to inspect each item of safety equipment provided by the University at least once a year for defects and wear and is to take remedial action where necessary.

#### **4.8 Test equipment**

Test equipment Shall be inspected by the user for visible defects on each occasion before and after use. Unless more frequent intervals are specified, the user Shall inspect each item of test equipment provided by the University at least once a year for defects and Shall take remedial action where necessary. Test equipment Shall be maintained and, where appropriate, re-calibrated, in accordance with the manufacturer's instructions.

These inspections and re-calibrations Shall be recorded in the University's planned preventive maintenance system

## **5 Working on and testing Low Voltage equipment**

### **5.1 General**

When work or testing is to be carried out on or near LV equipment, adequate working space, means of access and lighting Shall be provided to safeguard persons from Danger.

Where there is a possibility of persons mistaking HV equipment on which it is unsafe to work for LV equipment on which it is safe to work, the HV equipment must be positively identified at the point of work using an Approved method. Further suitable and adequate precautions Shall be taken to avoid Danger as appropriate.

When work or testing is to be carried out on equipment that is in proximity to HV equipment which may be Live, or become Live, the Authorised Person must determine under what conditions the work or testing is to take place and if a Safety Document is to be issued.

All work on LV equipment including Conductors Shall, where reasonably practicable, be carried out whilst such equipment and Conductors are:

- (a) Dead
- (b) Isolated from all sources of supply, so as to prevent inadvertent energisation during the course of the work. This may include the locking-off of switchgear, the removal of any fuses, links or a similar Approved method. Locking-off keys, fuses and links Shall be retained by the person working on the equipment.
- (c) Identified and proven Dead at the point of work by means of an Approved voltage testing device, which Shall itself be tested in an Approved manner immediately prior to and immediately following its use.

All work will normally be carried out when equipment has been made safe in accordance with the above conditions. However, the only exceptions to this rule are for the circumstances described in Section 5.6 "Work on or near Live Low Voltage electrical equipment".

### **5.2 Responsibilities**

All persons who work on LV equipment have a duty to comply with these Rules. Also, in addition to the responsibilities of persons detailed within these Rules:-

- (a) The person in charge of the work on site Shall complete the pre-work risk assessment.
- (b) The person in charge of the work Shall inform all members of the working party of the identified risks and necessary control measures before work commences.
- (c) Any additional working party members Shall be fully briefed before starting work.
- (d) All working party members Shall comply with the instructions and guidance provided by the person in charge of the work.

### **5.3 Identification**

Equipment on which work or testing is to be carried out must be readily identifiable or have fixed to it a means of identification that will remain effective throughout the course of the work or testing.

## **5.4 Isolation**

### **Extract from the Electricity at Work Regulations 1989**

#### **Regulation 12. - Means for cutting off the supply and for isolation**

*(1) Subject to paragraph (3), where necessary to prevent Danger, suitable means (including where appropriate, methods of identifying circuits) Shall be available for:-*

- (a) Cutting off the supply of electrical energy to any electrical equipment; and*
- (b) The isolation of any electrical equipment.*

*(2) In paragraph (1), "isolation" means the disconnection and separation of the electrical equipment from every source of electrical energy in such a way that this disconnection and separation is secure.*

*(3) Paragraph (1) Shall not apply to electrical equipment which is itself a source of electrical energy but, in such a case as is necessary, precautions Shall be taken to prevent, so far as is reasonably practicable, Danger.*

#### **Regulation 13. - Precautions for work on equipment made Dead**

*Adequate precautions Shall be taken to prevent electrical equipment, which has been made Dead in order to prevent Danger while work is carried out on or near that equipment, from becoming electrically charged during that work if Danger may thereby arise.*

In achieving isolation, the following steps Shall, where reasonably practicable, be completed:-

- (a) Application of a safe system of work to prevent the circuit breaker or switch being closed or fuse replaced wherever the equipment allows its use. The use of special locking devices or lockable fuse insets to allow the use of Safety Locks is recommended.*
- (b) Obtaining a visible gap in air.*
- (c) Fixing a Caution Sign at each point of isolation. The name of the person in charge of the work and the date may be added to each fixed Caution Sign to aid location of that person.*

The keys to any locks Shall be retained by the CP who applied them. If an AP applies the Safety Lock(s) prior to the issue of the Electrical Permit-to-Work, the key(s) Shall be retained by the AP.

Where an Electrical Permit-to-Work is not required and isolation is achieved by the removal of fuses or links, and it is not practicable to apply a lock, the fuses or links removed Shall be securely retained by the CP responsible for the work or test and a Caution Sign displayed.

Where work or testing is to be carried out on portable or hand-held equipment, isolation may be achieved by the removal of the plug from the socket outlet. The plug must remain in sight of the person carrying out the work or testing or have a lockable device applied to it which prevents it being inserted into a socket outlet. Where work is to be carried out on a distribution circuit, all reasonably practicable steps Shall be taken to ensure that there is no likelihood of an alternative supply being connected to the same circuit. Under these circumstances, work can be carried out with isolation at the controlling distribution board fuses.

## **More than one Point of Isolation**

Equipment to be worked upon Shall be isolated from all known voltage sources. Where more than one point of isolation must be established to achieve isolation, such isolation Shall be undertaken by an AP and an Electrical Permit-to-Work Shall be issued by the AP to the person carrying out the work.

### **5.5 Work on Low Voltage electrical equipment and Conductors made Dead and isolated**

When work is to be carried out on LV equipment which has been made Dead, suitable precautions are to be taken, where necessary, by Approved screening or other Approved means, to avoid Danger from inadvertent contact with Live Conductors in the zone of work.

Caution Signs Shall be securely fixed at all points of isolation for the equipment which has been made Dead and on which work is to be carried out. Danger Signs Shall, where practicable, be attached to any adjacent Live circuit Conductors, or electrical equipment containing Live circuit Conductors, that are adjacent to the point of work.

In cases where the work is concerned only with the external earthed metal parts of electrical equipment and no contact can be made with Live Conductors, or where the connected electrical equipment is physically removed from its normal location, the AP may allow certain measures under section 5.1 to be omitted providing they are satisfied that the measures taken are still adequate to prevent Danger.

### **5.6 Work on or near Live Low Voltage electrical equipment**

Work on Live Low Voltage equipment other than that specified below Shall not be undertaken. The Electricity at Work Regulations 1989, make it illegal to work on or near Live equipment, without first complying with Regulation 14.

**Regulation 14** - *No person Shall be engaged in any work activity on or so near any Live Conductor (other than one suitably covered with insulating material so as to prevent Danger) that Danger may arise unless:*

- (i) it is unreasonable in all the circumstances for the Conductors to be Dead **and***
- (ii) it is reasonable in all the circumstances for the person to be at work on or near the Conductor while it is Live **and***
- (iii) suitable precautions (including where necessary the provision of suitable Protective Equipment) are taken to prevent injury.*

The above represent a very severe legal test on the need to work Live and the answer to all three conditions Shall be 'Yes'.

Dead working Shall be the first choice and Live working only the very last method chosen when all other possibilities of providing alternative supplies or arranging out-of-hours shut downs of supply etc. have been carefully evaluated. Inconvenience alone is not a justification to work on or near Live exposed Conductors.

The exceptions to section 5.1 which involve a Competent Person, specifically authorised in writing, working on or near Live equipment are:

- (a) All forms of testing, fault finding or adjustment where practicalities dictate Live working

is essential.

- (b) The removal and replacement of fuse carriers in Final Circuits.
- (c) The removal and replacement of plug-in components.

When work of the type referred to above is carried out:-

- (1) The extent of work Shall be kept to a minimum.
- (2) Approved test equipment as defined in "Electrical test equipment for use by electricians", HSE Guidance Note GS38 Shall be used, together with any additional approved safety equipment which significantly reduces the risk of injury. The users of the above equipment Shall satisfy themselves by examination that the precautions taken are adequate and, before use, that the equipment to be used is suitable for the task.
- (3) Adequate means Shall be provided to prevent unauthorised access to the zone of work.
- (4) If the equipment is not to IP2X or IPXXB standard then a risk assessment Shall be undertaken.
- (5) The removal of components from connections or terminals Shall not be allowed. If disconnection of terminals or connectors is required the work Shall be carried as Table LV1.
- (6) There Shall be adequate lighting and adequate space for the intended work.

### **5.7 Testing and energising LV equipment**

Tests Shall be completed prior to energising LV equipment to confirm insulation integrity and continuity of Conductors. All equipment used when testing for reverse polarity and / or incorrect phase rotation situation Shall be Approved and must be checked annually. Each person undertaking work that involves the need to carryout polarity and / or phase rotation testing Shall have at least one on-site quality check each year.

Where work or testing has involved the initial connection or reconnection of Conductors, a supply Shall not be made available until the appropriate polarity checks and, if applicable, phase rotation checks are completed and confirmed correct. Instances of reverse polarity and / or incorrect phase rotation Shall be reported immediately to an AP.

The following principles Shall be used when testing LV equipment using Approved testing devices:-

#### **Testing Live or Dead**

- Test between all phase Conductors.
- Test between all phase Conductors and the neutral Conductor.
- Test between all phase Conductors and the earth Conductor.
- Test between the neutral Conductor and the earth Conductor.

#### **Polarity Testing**

- Test all phase Conductors.
- Test all neutral Conductors.
- Test all earth Conductors.

#### **Phase Rotation Tests**

Phase rotation tests for reference purposes Shall, where reasonably practicable, be completed before the supply is disconnected. This is particularly important in the Liverpool area as non-standard phase rotation may be present.

After the supply has been restored the following tests Shall be completed:

- Phase rotation tests to ensure that the supply is the same as recorded before the job.

- Where phase rotation checks have not been completed prior to disconnection (e.g. faults) at least one three phase supply must be checked to ensure correct operation of electrical equipment. Care should be taken to check for the presence of electronic equipment that corrects crossed phase situations.
- Where practicable, check across the closest open point to ensure that the two supplies are in phase.

## **5.8 Work on LV Cables**

### **Location of Underground Cables**

The process to be undertaken to both locate and work around underground cables Shall follow the Health and Safety Executive Guidance Note 47 'Avoiding Danger from Underground Services'.

Where it is proposed to carry out excavation work within the University's premises, it is the responsibility of the person who is to carry out such excavation work to ensure that all underground power cables within the proposed areas of excavation are located and their positions marked prior to excavation work being commenced. A risk assessment and method statement Shall be made available for the AP to review.

Where it is proposed to carry out excavation work on sites for which APs have been appointed, when advised, it is the responsibility of the AP to ensure that all underground power cables within the proposed areas of excavation are located, identified and their positions marked before the ground is disturbed.

Ducts containing cables Shall be accessed in accordance with an Approved procedure.

To prevent the inadvertent energisation of cut or capped cables, all LV underground cables Shall when installed or decommissioned be fitted with an Approved cable shorting device or cable joint at every end. This Shall be completed in accordance with an Approved procedure.

All LV cables installed in the ground (laid direct or in ducts) Shall where reasonably practicable be backfilled with either sand or another Approved aggregate, and if laid direct, marked using an Approved cable marking system (tiles or tape) before any part of the cable is energised via another part of the Low Voltage System.

In addition to the above, the person responsible for energising the LV cable Shall:-

- Ensure that the reinstatement is completed at the earliest opportunity.
- Consider the use of additional road signs and barriers to warn / guard the general public.
- Use Danger Signs fixed to the cable at various intervals (no more than 10 metres apart) throughout the length of the open excavation.
- Decide if increased inspections of the work area are required.
- Consider on-site security if there is deemed to be an increased risk of interference.

### **Identification and Spiking of Cables**

Before the Conductors of a cable are exposed or touched, a point(s) of isolation for the cable and the point of work on the cable Shall be identified with certainty.

The identification may be regarded as clear and certain if the cable can be seen throughout its length, or if it can be clearly seen between a point of isolation and the point of work.

An Approved cable location and identification device may be used where the above is not possible. No person Shall use a cable location and identification device unless they are competent to do so and have been specifically trained in their use. On successful completion



of such training, a certificate issued by the instructor Shall be placed in the operational procedure manual as evidence provided to the AP for verification

Training in the use of cable location and identification devices is normally given by the manufacturer of the equipment. However, it may be given by a CP who has been trained and certified by the manufacturer and evidence of this training Shall be provided to the AP for verification.

In the absence of clear and certain identification of a cable, it Shall be spiked at the point of work. Prior to spiking the cable, actions Shall, where reasonably practical, be taken to ensure the cable is not energised. This may include some or all of the following:

- (a) Interrogation of cable route plans.
- (b) Checking of size and type of cable against drawings.
- (c) Use of a current sensing device.
- (d) Cable core signal injection.

Before spiking it may be necessary to carry out insulation resistance tests to the cable cores that can be repeated after spiking and the results compared.

The spiking of cables may only be carried out by an AP who has been specifically trained in the operation of the equipment to be used.

Once proven dead, the cable cores Shall be “rung back” to the point of isolation to confirm the identity of the cable.

## 5.9 Table LV1

### **Summary of Activities to be carried out when a Competent Person (CP) is working on or testing Low Voltage equipment**

**EQUIPMENT** Circuits fed from a single source comprising of cables and other equipment on the load side of a Main Intake Switch. For interconnected circuits and other equipment on the supply side of a main intake switch, refer to Table LV2.

**THE STEPS BELOW ARE TO BE TAKEN IN NUMERICAL ORDER BY THE PERSON INDICATED**

NO	STEP	PERSON	ACTIVITY
1	IDENTIFY AND INFORM	CP	Identify circuit to be worked upon. Before any work or testing is commenced, permission Shall where reasonably practicable, be obtained from the person responsible for the area to be affected by the work or testing. Where appropriate, polarity and phase rotation checks Shall be carried out prior to the commencement of work.
2	ISOLATE AND FIX SAFETY SIGNS	CP	Isolate from all sources of supply and energy and ensure equipment is safe to work on or test. Fix Caution Signs at points of isolation and where practicable prevent unauthorised connection or operation by fixing Safety Locks. Retain Safety Lock Keys. Where appropriate, fix Danger Signs on Live equipment adjacent to the point of work or test.
3	PROVE DEAD	CP	Ensure that the equipment to be worked upon or tested is the equipment that has been isolated. Where practicable, prove Dead with an Approved voltage test indicator at the points of isolation and at the places where the work or test is to be carried out.
4	CONFIRM DEAD	CP	Where it was not practicable in Step 3 to prove the equipment Dead, the Competent Person Shall confirm it Dead at the point of work or test using an Approved voltage test indicator as soon as Conductors have been made accessible by using appropriate Approved tools and protective equipment where necessary. An Accompanying Safety Person Shall be present until the circuit has been proved Dead.
5	UNDERTAKE THE WORK OR TEST	CP	Undertake or Personally Supervise the work or test. On completion, or when the work is stopped and made safe, the Competent Person Shall positively establish the state of the work that has been undertaken, the presence of any tools or equipment and the existence of any abnormalities.
6	ENERGISE EQUIPMENT	CP	Remove Caution Signs and where appropriate, Safety Locks at points of isolation and also the Danger Signs on Live equipment adjacent to the point of work where appropriate. Energise the equipment and where appropriate, carry out polarity and phase rotation checks.
7	UPDATE	CP	Where relevant, notify the person responsible for the area affected by the work or testing, the state of the System. Where applicable, update relevant records and diagrams.

### 5.10 Table LV2

#### Summary of activities to be carried out by an Authorised Person (AP) to enable a Competent Person (CP) to work on or near Low Voltage equipment

**EQUIPMENT** Power Circuits with more than one source of supply, main intake switches, distribution circuits, switchboards and equipment having two or more sources of supply, cables and other equipment on the supply side of a Final Circuit.

**THE STEPS BELOW ARE TO BE TAKEN IN NUMERICAL ORDER BY THE PERSON INDICATED**

NO	STEP	PERSON	ACTIVITY
1	IDENTIFY, ISOLATE AND FIX SAFETY SIGNS	AP	<p>Before any work is commenced, permission Shall where reasonably practicable, be obtained from the person responsible for the area to be effected by the work.</p> <p>Identify circuit to be worked upon. Polarity and where appropriate, phase rotation checks Shall be carried out prior to the commencement of work.</p> <p>Isolate from All Sources Of Supply.</p> <p>Fix Caution Signs at points of isolation and where practicable prevent unauthorised connection or operation by fixing Safety Locks. Retain Safety Lock keys.</p> <p>Where appropriate, fix Danger Signs on Live equipment adjacent to the point of work or test.</p> <p>Ensure equipment is isolated from all sources of energy and is safe to work on or test.</p>
2	PROVE DEAD	AP	<p>Where practicable, prove Dead with an Approved voltage test indicator at the points of isolation and at the places where the work or test is to be carried out.</p> <p>Identify cables with certainty or spike underground cables at the point of work, if the Conductors are to be cut or exposed.</p>
3	ISSUE THE ELECTRICAL PERMIT-TO-WORK	AP	<p>The Competent Person Shall be shown the safety arrangements at all the points of isolation and at the point of work.</p> <p>Issue the Electrical Permit-to-Work to the Competent Person. Where it was not practicable in Step 2 to prove the equipment Dead, add this to the Electrical Permit-to-Work.</p>
4	CONFIRM DEAD	CP	<p>Where it was not practicable in Step 2 to prove the equipment Dead, the Competent Person Shall confirm it Dead at the point of work or test using an Approved voltage test indicator as soon as Conductors have been made accessible by using appropriate Approved tools and protective equipment where necessary.</p> <p>The Authorised Person Shall be present until the circuit has been proved Dead.</p>
<b>Continued overleaf</b>			
<b>Table LV2 continued from previous page</b>			
5	UNDERTAKE THE	CP	The Competent Person is to undertake or directly supervise

	WORK		the work and, on completion, or when the work is stopped and made safe, Shall return the original of the Electrical Permit-to-Work to the Authorised Person and clear the Electrical Permit-to-Work by completing Part 3 of both copies of the document.
6	CANCEL THE ELECTRICAL PERMIT-TO-WORK	AP	Cancel the Electrical Permit-to-Work by completing Part 4 of all copies of the document having positively established the state of the work that has been undertaken and the presence of any tools or equipment.
7	ENERGISE EQUIPMENT	AP	Remove Safety Locks and Caution Signs at points of isolation and also the Danger Signs on Live equipment adjacent to the Point of Work where appropriate. Energise the equipment and carry out polarity and where appropriate, phase rotation checks and restore the System.
8	COMPLETE DOCUMENTATION	AP	File the completed documents in the Authorised Persons' Office. Update records.

## 6 Documentation

### 6.1 Limited Work Certificate

In an area or location that is normally under the control of an AP for electrical safety reasons, a Limited Work Certificate may be issued by an AP (the issuer) for any specified task, other than one for which an Electrical Permit-to-Work is required, when the AP considers that additional guidance and warning of Danger is required over and above verbal guidance and warning.

A Limited Work Certificate Shall be comprised of Part 1- Issue, Part 2- Receipt, Part 3- Clearance and Part 4- Cancellation and Shall have an original card page (which is perforated and removable) and a paper copy page (non-removable) with both pages bearing the same serial number. Pads of numbered documents Shall be used in sequence.

Provided that a risk assessment indicates that it is safe, a Limited Work Certificate may be issued for work to be undertaken in an area or location containing an item of equipment for which a Permit-to-Work remains valid.

Where practicable, all items of Live equipment at the location are to be cordoned off from the working area covered by a Limited Work Certificate for the duration of the task. This should be achieved by placing temporary barriers, comprising as a minimum, "no entry" warning tape or equivalent prominent markers, to define the non-accessible area.

Danger Signs Shall be prominently displayed on all items of Live electrical equipment at and adjacent to the location to which the Limited Work Certificate applies and whilst it remains valid.

During the period the Limited Work Certificate remains valid, the issuer is, where appropriate, to arrange for the area involved to be inspected at the end of each working period or day to ensure, as far as reasonably practical, that:

- (a) Any flammable or hazardous materials introduced into the area during the work activity are removed when the activities cease at the end of each working period or day.
- (b) Emergency escape routes, emergency exits and access to essential electrical equipment has not been obstructed.

#### Issue

The following procedures apply to the issue of a Limited Work Certificate:

- (a) The AP Shall enter on the Limited Work Certificate, details of the work to be done and the safety precautions applicable
- (b) The original of the Limited Work Certificate Shall be issued to the person in charge of the work, who, after readings its contents and signifying to the AP that the instructions etc., are fully understood, Shall acknowledge its receipt by signing the declaration on Part 2 of the Limited Work Certificate.
- (c) The recipient of the Limited Work Certificate Shall retain possession of the original page at all times whilst the work detailed on the Limited Work Certificate is being carried out.
- (d) Where more than one working party is concerned, a Limited Work Certificate Shall be issued to the Person in Charge of each working party.
- (e) A Limited Work Certificate is not to be issued for work in the vicinity of any item of equipment which is already the subject of another Safety Document.

## **Cancellation**

When work for which a Limited Work Certificate has been issued is stopped or completed, the person to whom it was issued Shall sign the declaration on Part 3 of the original page and return the Limited Work Certificate to the AP who Shall cancel the document by signing the declaration on Part 4. The original page will then be retained by the issuer and stored in the Operations Locker for a period of three years for future reference.

## **6.2 Electrical Permit-to-Work**

An Electrical Permit-to-Work Shall be issued by an AP (the issuer) to a second person (the recipient) when work is to be carried out on, or near, electrical equipment which must be isolated as a safety precaution for the duration of that work. The work will then be carried out in accordance with Table LV2

An Electrical Permit-to-Work Shall be comprised of Part 1- Issue, Part 2- Receipt, Part 3- Clearance and Part 4- Cancellation and Shall have an original page and two duplicate copy pages with all pages bearing the same serial number. Pads of numbered documents Shall be used in sequence.

### **Issue**

An Electrical Permit-to-Work is issued to the person in charge of the work (the recipient) at the point of work once the issuer is satisfied that the recipient has the correct level of relevant technical knowledge and expertise.

Prior to offering an Electrical Permit-to-Work to the recipient, the issuer Shall:

- (a) Identify to the recipient the equipment that has been isolated.
- (b) Identify the points of isolation.

The issuer Shall then sign Part 1 of all copies of the Electrical Permit-to-Work.

The recipient Shall demonstrate to the issuer that he understands the contents of the document and then sign Part 2 of both copies of the Electrical Permit-to-Work.

The original card page Shall be given to the recipient and one paper copy Shall be retained by the issuer and one paper copy Shall remain in the Permit to Work office.

### **Clearance/Cancellation**

When the recipient has completed the work for which the Electrical Permit-to-Work was issued, or wishes to clear it, the recipient Shall complete Part 3 of all copies of the document at the place where the work was carried out and return both copies to the issuer. The issuer Shall then complete Part 4 of all copies of the document to cancel the document.

Completely filled pads of Electrical Permit-to-Work forms and the original documents Shall be retained in the Authorised Persons' Office for three years after the date of cancellation of the last Electrical Permit-to-Work issued from the pad.

## **6.3 Operating Records**

### **Safety Rules**

Each CP and AP Shall be issued with a copy of these Rules.

### **Authorised Persons' Office**

An area which ideally is to be a separate office, entitled "Authorised Persons' Office" Shall be established.

The Authorised Persons' Office Shall contain a copy of each of the following:

- (a) A certificate of appointment issued to a Competent Person or for contractor's Competent Person and a letter of competency from the contractor's employer.
- (b) A register of Competent Persons including details and dates of training, issue dates and review dates of certificates, etc.
- (c) The original of every Electrical Permit-to-Work including any completed and subsequently not used.
- (d) Details of protective equipment and test equipment kept within the establishment, including specifications, operators or users, instructions, maintenance instructions and, where appropriate, calibration records.

Completed Safety Documents in the Authorised Persons' Office Shall be retained for a period of three years after the date of their cancellation or termination.

## **7 Audit and Review.**

Electrical Technicians have been allocated areas of the Brownlow Hill Campus as shown in Appendix 2. Each technician Shall report any concerns for his area initially to the Authorised Person who may escalate them to the Engineering Maintenance Manager if thought necessary. Such concerns may include poor workmanship undertaken by contractors when Switchrooms are left in an inappropriate condition e.g. switchgear open, exposed parts, trunking lids off, unfixed cables, stored & flammable materials, routing of other services through Switchrooms etc.

The Authorising Engineer Shall lead formal audits relating to this process. These audits are to drive improvement to both the condition of the infrastructure and the safety processes associated with the management of the Low Voltage System with respect to staff, students, and contractors.

The Authorising Engineer Shall undertake audits twice per year and a formal report of findings and recommendations Shall be issued for each visit to the Engineering Maintenance Manager.

The Assistant Responsible Person Shall facilitate an FRCS Compliance Meeting with relevant stakeholders meeting at least three times a year for a formal review of opportunities and issues in a spirit of continual improvement.

Further information and guidance on access to switchrooms can be obtained in the Standard Operating Procedure "Management of Access to Low Voltage Switchrooms at the Main Campus, Brownlow Hill".



## **8 Health and Safety**

### **8.1 Display of posters**

Where the University has control of the Danger, the Engineering Maintenance Manager Shall carry out an assessment to determine the requirement and location for the display of information in connection with these Rules. Information Shall be displayed permanently in suitable and prominent positions. The areas to be considered for the display of information in connection with these Rules Shall include every Substation, workshop and the Authorised Persons' office.

Other Information and posters to be displayed may include:

- (a) The Electricity at Work Regulations 1989.
- (b) Any of the tables from these Rules.
- (c) Other relevant health and safety Information.

### **8.2 Emergency First Aid Training**

#### **General**

Training in emergency first aid Shall be provided by organisations whose training and qualifications for first- aiders are approved by the Health and Safety Executive for the purposes of the Health and Safety (First-Aid) Regulations 1981.

Training courses Shall include the following subjects:

- (a) Resuscitation (as appropriate for the treatment of electric shock).
- (b) Treatment of burns.
- (c) Control of bleeding.
- (d) Treatment of the unconscious casualty.
- (e) Contents of first aid box.
- (f) Communication.

This training Shall be repeated, as a minimum, every three years.

Copies of certificates issued to Authorised Persons, Competent Persons and Accompanying Safety Persons Shall be held in the Authorised Persons' Office.

## **9. Appendices**

## **Appendix 1      *Associated Regulations and Documents***

These Rules are based on and comply, where applicable, with the following regulations and documents: -

1. Health and Safety at Work etc. Act 1974.
2. Management of Health and Safety at Work Regulations 1999.
3. Approved Code of Practice for Management of Health and Safety at Work Regulations 1999.
4. Electricity at Work Regulations 1989.
5. Memorandum of Guidance on the Electricity at Work Regulations 1989.
6. Electricity at Work: - Safe Working Practices. Health and Safety series booklet HS (G) 85 issued by the Health and Safety Executive.
7. Requirements for Electrical Installations: IET Wiring Regulations, BS 7671:2008.
8. Inspection and Testing guidance Note 3, issued by the IET
9. Code of Practice for in-service inspection and testing of electrical equipment, issued by the IET.
10. "Electrical Equipment for use by electricians". Guidance Note GS 38 issued by the Health and Safety Executive.
11. The Personal Protective Equipment Regulations 1992 (EC Directive).
12. Manual Handling Operations Regulations 1992.
13. Provision and Use of Work Equipment Regulations 1998.
14. Construction (Design and Management) Regulations 2007
15. Health and Safety (First-Aid) Regulations 1981 Approved Code of Practice and Guidance.
16. Workplace (Health, Safety and Welfare) Regulations 1992.



## **Appendix 3 TREATMENT FOR ELECTRIC SHOCK**

### **IMMEDIATE AND SPEEDY ACTION IS VITAL**

The following methods should be learnt from a qualified instructor and practiced regularly.

#### **1. FREE FROM CONTACT BUT DO NOT PLACE YOURSELF OR OTHERS IN DANGER.**

- Switch off the supply immediately or send someone to do so.
- Do not attempt to remove a person from contact with High Voltage unless suitable articles insulated from the System voltage are used for this purpose.
- When attempting to free a person from contact with Low Voltage use rubber gloves, boots, or mats, or insulated stick, but if these are not available use a loop of rope, cap or coat to drag the person free.
- Whatever is used should be dry and non-conducting.

#### **2. AFTER RELEASE**

- Do not waste time moving the person.
- Lay the casualty down on something dry, if possible, and check for response.
- If the casualty appears to be unconscious, shake the shoulders and shout "Wake Up".
- If there is no response, IMMEDIATELY SHOUT FOR HELP and proceed as follows.

#### **3. OPEN THE AIRWAY**

- Turn the casualty onto their back.
- Tilt the head and lift the chin to open the airway (Figure 1).
- Carefully remove any obvious debris from inside the mouth.



**FIGURE 1: CLEAR AND OPEN AIRWAY**

#### **4. CHECK BREATHING AND PULSE**

- Keeping the airway open, check to see if the breathing is normal and take no more than 10 seconds to do this.
- Listen for breaths.
- Feel for breaths on your cheek (Figure 2).
- Check for the pulse by placing your fingers to one side of the voice box and pressing gently downwards
- If the casualty is breathing normally, place them in the recovery position (Figure 6).
- If the casualty is not breathing normally ask someone to call for an ambulance or if you are on your own, use your mobile phone. Only leave the casualty if there is no other way of summoning support.



**FIGURE 2: CHECK BREATHING & PULSE**

## 5. CHEST COMPRESSIONS

- Kneel at the side of the casualty and prepare to start chest compressions at once.
- Place the heel of one hand in the centre of the casualty's chest (Figure 3), then place the heel of your other hand on top and interlock your fingers Figure 4).
- Position yourself vertically above the casualty's chest with your arms straight.
- Press down the breastbone 5-6cm then release without losing contact between your hands and the chest. Avoid applying pressure over the casualty's ribs, the bottom end of the breastbone or the upper abdomen.
- Compression and release should take an equal amount of time.
- Perform Do 30 chest compressions at a rate of about 100-120 per minute.



**FIGURE 3: COMPRESSION POINT**



**FIGURE 4: HAND CLASP**

## 6. RESCUE BREATHS

- Now combine chest compressions with rescue breaths
- Open the airway again using head tilt and chin lift (Figure 5)
- Nip the soft part of the casualty's nose closed. Allow the mouth to open but maintain chin lift
- Take a normal breath and seal your lips around the casualty's mouth, making sure you have a good seal.
- Blow steadily into the casualty's mouth whilst watching for the chest to rise (rescue breath) taking about 1 second to make the chest rise.
- Keeping the airway open, remove your mouth. Take a normal breath of fresh air and watch for the casualty's chest to fall as air comes out.
- Re-seal your mouth and give another rescue breath – 2 in total. Giving both rescue breaths should not take more than 5 seconds.
- Return your hands without delay to the centre of the chest and give another 30 chest compressions and then 2 more rescue breaths.
- Continue repeating cycles of 30 chest compressions and 2 rescue breaths.
- Only stop and recheck the casualty if they show signs of regaining consciousness AND start to breathe normally – otherwise do not interrupt resuscitation.



**FIGURE 5: RESCUE BREATHS**

If there is more than one rescuer present, they should take over from each other every 2 minutes to avoid fatigue. Ensure the minimum delay during changeover and do not interrupt chest compressions.

If the initial rescue breath in each sequence does not make the chest rise, give another 30 chest compressions. Then, before the next attempt.

- Check the casualty's mouth and remove any visible obstruction.
- Recheck that there is adequate head tilt and chin lift
- Do not attempt more than 2 breaths each time before returning to chest compressions

Continue resuscitation until

- Qualified help arrives and takes over

- You become exhausted OR
- The casualty shows signs of regaining consciousness such as coughing open their eyes or moving purposefully AND starts to breathe normally.

## **7. OTHER INJURIES**

After breathing, priority should be given to controlling bleeding. This is achieved by firm pressure on the wound.

- Cover with a clean dressing and bandage firmly in place.
- If bleeding continues add further dressings on top of the first and increase the pressure by bandaging firmly in place. Never disturb original dressings as some clotting will have taken place.

Burns should be covered with a clean, sterile dressing to exclude air. The dressing should be bandaged lightly in position. Unless it is dangerous to leave the casualty at the site of the accident expert assistance should be sought before other injuries are treated. If it is necessary to move the casualty, do so with the utmost gentleness carefully supporting any injured parts.

## **8. RECOVERY POSITION**

Unconscious casualties who are breathing and have a pulse are to be turned into the recovery position (Figure 6).



***FIGURE 6: RECOVERY POSITION***

## **9. FIRST AID APPLIANCES**

The first aid appliances provided Shall be used only for the purpose intended. A person Shall be appointed to be responsible for ensuring that supplies are always available.