

Estates and Facilities Guidance Note EHSGN -1

Electrical Safety

Issue #1 Jan 2021

The Directorate of Estates and Facilities operates electrical services throughout the campus. These services present risks to staff, students, contractors and visitors.

The Electricity at Work Act 1989 is relevant to all these services, and is to be implemented for all work, with, upon or in proximity to the electrical services.

The aims of this document are twofold:

- a. To ensure those attending, working or visiting the site are not involved in any safety incidents arising from failure of equipment or bad practice which causes injury or loss around the electrical systems under the control of the Directorate of Estates and Facilities Electrical Services Engineer.
- b. Achieve compliance with the Health and Safety at Work Act 1974.

Responsibility for Specific parts of an installation

Compliance with the Electricity at Work Act is the responsibility of the Director of Estates & Facilities for equipment operated by the directorate. The electrical Services Engineer will support the Director of Estates & Facilities in relation to the implementation of the Electrical Safety Guidance note.

The Directorate of Estates and Facilities operates the infrastructure between the Distribution network operator's incoming connections to the point of connection (socket or isolator) for the equipment various departments, where the School or Service operates, maintains or hires the equipment.

The University's Electrical infrastructure & electrical life safety systems are designed, installed, operated, maintained and de-commissioned by the Estates & Facilities Electrical Services Engineer, or by contractors / consultants acting on the behalf of.

Additional services are installed and/or maintained by the Directorate of Estates and Facilities, these are:

Post Holder	Manager/Duty
Building Services Controls (BMS)	Mechanical Services Engineer
Catering equipment (Vending, Cookers etc.)	Catering Services Manager
Security systems, (CCTV, Access control etc)	Security Manager
Cleaning equipment (Vacuum cleaners, Hand dryers, etc)	Cleaning Services Manager
Lamp Changing	Campus Support Manager
Lamp changing, Minor Electrical Works, Site Support	Maintenance Services Manager
Energy Management system and meter readings	Carbon Reduction officer
Auto doors/ shutters/barriers	Building Technician

Other schools or services may operate their own system or rules. Where applicable this should be identified in the risk assessment and method statements associated with the task.

The Directorate of Estates and Facilities will make arrangements for:

Planning Phase

- Those involved in the design, commissioning, maintenance of electrical equipment are competent. (See appendix 1)
- Technical training of post holders as required by their role
- Systems are compliant with the IEE Wiring regulations or BS7671
- All equipment shall be manufactured to British Standards or/and CE marked. Where equipment is being tested or developed, the same principles will apply to the equipment.
- All electrical work, or that adjacent to live services is managed to avoid or reduce risk. (See appendix 5)
- Record drawings for services or sufficient survey to prevent danger
- Equipment to be suitable to the environment in which it is used e.g. splash proof, construction site or flammable.
- Identify end of life equipment and request budget for replacement

Work Phase

- Contractors are part of an approved scheme, NICEIC or ECA
- Equipment to be isolated when works are performed upon or adjacent to, unless it is unreasonable in all circumstances for it to be dead. (See Appendix 3)
- Fixed wiring installations are only modified by under the control of the above post holders, including final connections at fixed termination points.
- No unauthorised repairs or disassembly of electrical equipment shall be permitted.

Check Phase

- Records of maintenance and testing are to be safely recorded.
- All equipment is maintained in a safe condition, to the schedule in (See Appendix 4)
- Faulty equipment shall be removed from service, repaired or disposed of.
- Users of equipment to have sufficient knowledge to operate equipment and identify faults, withdraw from service and inform their manager

Act Phase

- Carry out annual review of the Electrical Procedures by the University's Electrical Services Engineer

High Voltage works

The operation and maintenance of the University's High Voltage network is contracted out to a specialist company, who operate under their own rules and procedures.

HV works may be arranged by the Electrical Services Engineer but will be fully controlled by the Senior Authorised Person from the HV contractor.

Emergency switching of supplies can be effected at the metering points for intakes.

Appendix 1

Definitions, Authorisation and Access

Extra Low voltage

Not exceeding 50V AC or 120V ripple free DC between conductors or earth

Note – Some low voltage systems may have significant energy levels if subjected to a short circuit.

Low voltage

Exceeding extra low voltage but not exceeding 1000V AC or 1500V DC between conductors, or 600V AC or 900V DC between conductors and earth.

High Voltage

Normally exceeding low voltage

As defined by the IET Wiring regulations (BS7671, Amendment 3, 2015)

Low Voltage Authorized Person

A person authorized by the University's Electrical Services Engineer to control access, switching, isolation, issue permits for works associated with Low voltage or extra low voltage installation, when required.

Apprentice Electrician

A person being trained to carry out the tasks of an Electrician, who is under supervision of a skilled person.

Electrician

A person with sufficient technical electrical knowledge and experience to avoid any actions which may give rise to reasonably foreseeable risks to others and those around, created by electricity.

Substation Access Trained person

A person who may have little electrical knowledge but requires access to switch rooms or the like for maintenance functions e.g. painting. The person shall have undergone a suitable training course to identify the risks of entering such a room, and the limitations of their permissions.

Accompanying Safety person

A person not involved in the work or test activity but has been instructed on the means to disconnect the supply in the event of an emergency, summon help and offer first aid.

HV Operator and maintainer.

A company, appointed by the University, with sufficient resources to offer suitably experienced personnel with knowledge, training and expertise to manage a private High Voltage network as defined by HSG230.

High Voltage Senior Authorised Person

As defined and regulated by the appointed High Voltage Operation and Maintenance provider.

Duty Holder

A person who has electrical equipment under their control, who purchases, uses or maintains equipment.

Appendix 2

Competency

No person shall be engaged in any task where they are not competent:

The Electricity at Work Act defines competency as:

Possesses such knowledge or experience or is under such degree of supervision as may be appropriate having regard to the nature of the work.

To assess a person's competency, they should be able to demonstrate:

1. Adequate knowledge of electricity
2. Adequate experience of the electrical work being carried out
3. Adequate understanding of the system to be worked on and practical experience of that class of system
4. Understanding of the hazards which may arise during the work and the precautions which need to be taken
5. The ability to recognise at all times whether it is safe for work to continue

Low voltage works

1. All external staff engaged on electrical works shall provide a copy of the CSCS, JIB or similar cards prior to any operative working on or near the electrical installations.

It is likely maintenance works will be undertaken by people / companies who fall outside of the above trade schemes. The person arranging the works must take steps to ensure a similar level of competency.

2. The University's internal staff (Combined Services Group) are subject to separate training and competency checks. The minimum is:
 - City & Guilds Certificate 236 / 2360 parts 1 and 2; or
 - NVQ 3 in Electrotechnical Systems and equipment with Formal Apprenticeship / AM2 / demonstrable previous applicable experience.Or
 - Suitably supervised by the above.

Ongoing Training

The University will arrange for sufficient training and updates as required for their electrical staff to be able to maintain their competency. The key electrical training revolves around:

Subject	Period
BS7671 IEE Wiring Regulations	Upon new amendment being released
Sub-station access	3 Yearly
Fire Alarm	Upon release of new panels

High Voltage works

By the nature of High Voltage works, the risk associated with the work upon and in proximity to require additional steps to ensure safe operation.

All High Voltage operations are carried out under contract with the appointed HV Operator.

The HV Operator shall be selected on grounds of safety, competence, resource availability and cost. The University's Electrical Services Engineer shall appoint the High Voltage Contractor.

The High Voltage Contractor shall have a dedicated set of safety rules applicable to the equipment and tasks being undertaken.

In addition the High Voltage Contractor will have:

- Membership of the National Electricity Registration Scheme
- A Quality Assured Management system to ISO9001
- A Safety Management System to ISO45001
- Membership of Contractors Health and Safety Assessment Scheme (CHAS)
- Significant Resource of High Voltage Authorised Persons
- Significant experience of largescale implementation of HSG230

Appendix 3

Authorisation

The matrix below notes levels of authorisation to carry out certain types of work.

There may be circumstances when this can be varied, but permission must be gained in writing from the Electrical Services Engineer

Role	Task										
	Produce Risk assessments	Check Risk assessments	Servicing or repair of duty holders equipment	Carryout connection to distribution system	Carryout modifications to distribution system	Enter Substations	Issue LV Permit to work	Issue HV permit to work/ sanction	Review/Modify safety procedure	Identify buried cabling	Carryout work on live systems (see appendix 5)
Apprentice Electrician	No	No	Yes[1]	Yes[1]	Yes[1]	Yes[2+3]	No	No	No	No	No
Electrician	Yes	No	Yes	Yes	Yes	Yes[2+3]	No	No	No	No	Yes
Substation access trained Person	Yes	No	No	No	No	Yes	No	No	No	No	No
Low Voltage Authorised Person	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Accompanying safety Person	No	No	No	No	No	Yes[4]	No	No	No	No	No
Senior Authorised Person (HV)	Yes	Yes	No	Yes	Yes[2]	Yes	Yes	Yes	No	Yes	Yes
Duty Holder	Yes	Yes	No	No	No	No	No	No	No	No	No
Electrical Services Engineer (Estates)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Electrical Services Technician (Estates)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Service engineer for equipment	Yes	No	Yes	No	No	No	No	No	No	No	Yes

[1] – Under Supervision of a competent person

[2] – Having undertaken and successfully passed a substation access course

[3] – If authorised in writing by the Electrical Services Engineer, with a Limitation of Access form, signed and in date

[4] – Must be briefed by Electrical Services Engineer / Senior Authorised Person

Appendix 4

Accessing site / electrical equipment

The University has an obligation to control access to electrical distribution and switch gear systems, this is achieved in the following ways.

1. Prior to any works starting on site, persons engaged to carry out works will need to attend and complete an Estates and Facilities induction. This will be renewed on a regular basis, currently 12 months.

The Security Hub will not issue any keys to persons without a contractor or visitor pass (obtained from the Estates and Facilities Reception on completion of an induction)

2. Switch gear is located behind locked doors in switch cupboards or secured by means of the front cover having a lockable door on the to prevent access. Keys are available from Security or source within the Estates offices.
3. HV enclosures, rooms etc are controlled more stringently- 4 keys exist
 - a. A High voltage Senior Authorised / Authorised person (SAP/AP) for the HV Maintenance company can draw a key from the key safe located at the back of the security counter. The SAP will need to be able to provide a High Voltage operators safety lock key to open the box.
 - b. Those in possession of a completed limitation of access form (issued by the University of Huddersfield's Electrical Services Engineer) can, upon presenting current document to Security be provided with the key for High Voltage areas. The works which can be carried out under this authority are limited to fabric repairs, low voltage works and general system maintenance on equipment not associated with the High Voltage distribution gear. This in most cases will be restricted to the in-house labour force, the Combined Services Group, (CSG). The CSG will be trained and undergo substation access courses on a 3 year basis.
 - c. The University Electrical Services Engineer has a privately held key.
 - d. The Carbon and Energy Reduction Officer has a key to be issued to meter readers when meter operators require access.

There are no exceptions to the above.

4. The controls placed upon contractors are attached to all tender documents,

When work has been completed or a room is to be left un-occupied the key holder shall be responsible for securing the room prior to departing.

Appendix 5 Live working

Work on or near Live equipment (Electricity at Work Act 1989 - Reg 14)

Live working is **not permitted** on the University's sites, unless

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

Where the above conditions are met, live working is permissible, examples of which are listed below.

1. Proving a supply is dead (must be treated as live until confirmed)
2. Working on electrochemical storage systems
 - a. Battery systems (UPS, Emergency lighting, Engine starting systems etc)
 - b. Capacitor devices (Power factor correction, Inverter's etc)
3. Work on Photovoltaic devices.
4. Commissioning of control and instrumentation systems
5. Fault finding (where it is inappropriate to use dead testing)
6. Testing of fixed wiring installations as prescribed by BS7671.
7. Electric Welding, (MMA, MIG, TIG etc)
8. Spiking buried cables (to confirm dead)

The above list is not intended to be exclusive, clarification from the University's Electrical Services Engineer shall be sought if in doubt.

Any live working must be either:

1. Subject to suitable and specific risk assessment, submitted to the University Low Voltage Authorised Electrical Person, for comment as required, prior to commencement of any live work.
2. Carried out under standard working procedures agreed with the Electrical Services Engineer in advance.

Bench testing of kit shall incorporate 30mA RCD protected supply, warning signs, rubber matting etc

Refer to HSG85

Appendix 6 Risk Assessments

Prior to any works being carried out on the electrical systems at the University, there shall be a documented plan of works, this shall be relative to the danger and risk associated with the works.

The plan shall incorporate standard working procedures and RAMS as required to satisfy the Management of Health and Safety at Work Regulations 1999.

Generic RAMS are unlikely to cover sufficient points to meet the requirements of this document.

The plan is likely to incorporate the points listed.

1. Is sufficient information available to plan the task, are surveys required to attain the information?
2. Can the works be carried out dead, or do they need to be carried out on or around live systems?
 - a. Note – where live working is required this must be demonstrated as **unavoidable**.
3. What other risks are associated with the works? e.g. asbestos flash guards in switchgear
4. Is work taking place affecting or within a flammable area? e.g. chemical or spirit store
5. Are buried services in the area, is their location known and are they in service?
6. Is a Permit to Work required?
 - a. Permit to work is required on any equipment which:
 1. has more than one source of supply e.g. UPS or generator back up;
 2. is labelled "Permit Ref";
 3. is identified in the RAMS as requiring a Permit To Work; and
 4. has major supply points to building/critical equipment.
 - b. Note – Other Permits may be required, e.g. working at height etc.
7. Is a Limitation of Access required to enter a sub-station?
8. Who will carry out the works? Provide:
 - a. names of those undertaking work;
 - b. copies of CSCS card with photograph; and
 - c. training records may be required where additional skills are identified as needed
9. Where is the system to be isolated?
 - a. does the High Voltage supply need to be isolated;
 - b. provide circuit reference / circuit name;
 - c. provide photograph of equipment; and
 - d. identify all sources of supply, including:
 - a. Generators
 - b. Batteries
 - c. PV / Embedded generation

- d. Capacitor devices – e.g. power factor correction (do not rely on discharge resistors)
 - e. Research equipment
 - f. Isolation may be required in several places
10. How is the equipment to be isolated? (it must be a “Secure Isolation”):
- a. Does equipment have provision to lock off?
 - a. If not, it may be necessary to isolate further upstream.
 - b. What type of lock off is required?
 - a. Shackle size of padlock;
 - b. Multilock off device;
 - c. MCB toggle for locking off; and/or
 - d. Specialist lock off device e.g. Square D I line MCCBs
 - c. Who will retain key or keys / is a lock off box required?
 - a. The person controlling the works will need to be on site to restore power or sign off a permit
 - d. Is the test equipment required suitable for the task?
 - a. Compliant with GS38;
 - b. Fused test leads;
 - c. Formally Inspected no more than 12 months ago;
 - d. Inspected immediately prior to use;
 - e. Checked by means of a proving unit;
 - 1. Note – the use of a known source is to be avoided, this is live working
 - 2. Check proving unit is working using test facility
 - 3. Carry spare batteries for equipment
 - f. The use of non-contact “Volt sticks” is not permitted for confirming isolation. They may however be useful to identify live circuits present; and
 - g. Cable Avoidance Tools (CAT) to detect buried cables.
11. What Critical equipment is supplied by the circuit e.g. freezers, computers, fire alarms etc, has this been agreed with the owner / user?
12. Anticipated duration of works:
- a. Are generators required for temporary supplies, lighting, power tools, where will these be located, and sufficient ventilation?
13. Confirm tools required are available for the works, in good condition and used correctly
14. Provide dedicated temporary storage for parts, bolts, tools, no storage of equipment should be in the equipment being opened / worked upon.
15. What PPE is required?
- a. Arc flash overalls
 - b. Visor / glasses
 - c. Gloves / insulated gloves
 - d. Helmet
 - e. Temporary screening
 - f. Safety Boots / Insulated boots
 - g. Is the PPE in good condition, maintenance records, within end of life

- dates
- h. Insulated shovel

PPE is an additional measure for safety and not accepted a method of undertaking or controlling works with avoidable risks.

16. What temporary lighting is required, at work area and access routes to external area, stores/van etc.?
17. Warning signs will be required at work area:
- Caution Persons Working on Equipment (usually attached to hasp of padlock);
 - Caution "Live Equipment", located on adjacent live equipment; and/or
 - Live Work / Testing in Progress – No access
18. Ensure persons not involved in the works are excluded from the area, use barriers as required
19. Provision for cleaning out equipment where work has taken place
- A battery powered vacuum cleaner is likely to be required to ensure the equipment is left clean; and
 - The equipment should be offered to the University's Low Voltage Authorised Person prior to covers being fitted.
20. Prior to the works being commenced the labelling required (as specified – engraved traffolyte, with bolted fixings) shall be on site. The description of any new circuit references will be agreed with the designer of the system prior to manufacture.
21. Note provision and location of first aid equipment
- Note – the University has defibrillators on site, with trained operators – dial extension 2222, or from a mobile phone 01484 472222, clearly stating the location of the incident.
22. Additional steps where live working (or working near to live equipment) is required:
- An additional person (an Accompanying Safety Person) must be in attendance to the person working on or near the system at all times. They may not be an electrician but should have sufficient training to isolate power and arrange first aid;
 - Only competent persons, with training to work on live equipment will be permitted to do so;
 - Sufficient information with regards to the work area to identify live components;
 - Split battery / PV strings in to reduced voltage / energy strings;
 - Utilise insulated equipment, tools, test equipment; and
 - Provide additional temporary barriers and insulation, including
 - Shrouding of adjacent parts
 - Electrical insulating mats
23. Collaboration
- Has the work been planned with the relevant people including:
 - Electrician undertaking works;
 - Company Safety advisor;
 - Directors;
 - CDM Principle Designer; and
 - University's Electrical Authorised person

24. Is sufficient time been allowed to carry out the process of planning.

The above should not become a tick list to be sped through, it is an aide memoire. This will, however, be used for reviewing Risk Assessments & Method Statements or Standard Working Procedures.

It can be observed from the non-comprehensive list above the planning works required are extensive and will require significant thought and documentation prior to works being approved.

**Appendix 7
Maintenance Periods**

Service	Frequency	Guidance
HV Distribution network Operation of equipment and oil sampling	4 Yearly	High Voltage maintenance provider / HSG230
HV distribution network Inspection of HV enclosures, chargers and labelling	Annual	High Voltage maintenance provider / HSG230
Low Voltage Distribution and lighting (non public areas)	5 yearly inspection of 20% of service	BS7671 Guidance note 3
Low Voltage Distribution and lighting (areas open to public)	Annual inspection of 100% of service	BS7671 Guidance note 3
RCD operational test	Annually	BS7671 Guidance note 3
Emergency Lighting	Monthly/ Annually	BS5266
Fire Alarm Systems	Weekly / Annually	BS5839
UPS Systems	Annually	Manufacturers Guidance
Generators	Bi-annually	Manufacturers Guidance
Portable Appliance Testing	Annually (minimum)	HSE/IET guidance
Lightning Protection	11 monthly (max 13 Monthly)	BS EN 62305
Other equipment owned/operated by Duty Holders	Maximum of 24 months between inspections	Duty Holder to identify and carryout.