

## UON Key Risk Area: KRA 3.6

### Electrical Safety and Energy Isolation

#### 1. Purpose

To provide guidance on the procedures that must be implemented to protect staff, students, conjoints and contractors working on or in the vicinity of electricity.

#### 2. Scope

This document applies to all Faculties, Divisions, and organisational units of the University of Newcastle and its controlled entities.

#### 3. Definitions

In the context of this document, the following definitions apply:

- **Electrical Equipment:** Any equipment that is energised by electricity.
- **Portable Equipment:** Equipment which is moved in operation, or an appliance which can be easily moved from one place to another while connected to an electrical supply.
- **Extra Low Voltage:** Voltage that does not exceed 50V alternating current (AC).
- **Low Voltage:** Exceeding extra-low voltage, but not exceeding 1000V AC.
- **Residual Current Device (RCDs):** An electrical wiring device that disconnects an electrical circuit whenever it detects that the electrical current is not balanced between the energised conductor and the return conductor.
- **Energy Isolation:** The separation of equipment or circuits from energy sources.
- **Competent Person:** A person who has, through a combination of training, education and experience, knowledge and skills enabling that person to correctly perform a specified task.
- **Leaders/Supervisors:** Any member of the University who is responsible for supervising staff and/or undergraduate or postgraduate students and/or for leading research projects.

- **Workers:** As defined in the NSW Work Health & Safety Act 2011, workers include employees, conjoints, students on work experience, contractors, sub-contractors and their employees. Staff, conjoints, students on work experience, and contractors may be referred to collectively as workers, or separately as staff, conjoints, students, or contractors.

## 4. Responsibilities

### 4.1 Infrastructure and Facilities Services (IFS)

- Ensure that all new plant and equipment will be purchased / supplied with facilities to accommodate a positive locking device. Where possible, (e.g. during upgrade works or following a risk assessment), existing installations will be upgraded to accommodate a positive locking device;
- Ensure electrical work is conducted in accordance with this procedure;
- Ensure that contractors who are required to undertake electrical work have the appropriate procedures, equipment and competent personnel to undertake the work;
- Ensure that when portable tools are to be used by contractors that RCDs are available to protect the electrical circuit;
- Ensure that portable electrical equipment used by contractors has been tested and tagged (see UON KRA 3.9 Electrical Testing and Tagging);
- Ensure that where contractors are required to work on energised equipment energy isolation procedures are followed;
- Provide information to affected locations where electrical work is to be conducted to ensure the necessary actions are taken to protect staff and students who work in the area.

### 4.2 Leaders/Supervisors

- Ensure that risk controls are followed when they are implemented to protect staff and students when electrical work is to be conducted.

### 4.4 Health and Safety Team

- Provide professional input regarding electrical activities when required.

## 5. Procedure

### 5.1 Risk Assessment

- Prior to installation of any new electrical equipment a risk assessment will be conducted and any manufacturers, suppliers or contractors involved in the installation will be assessed prior to work commencing for their ability to comply with the safety requirements for the work and the requirements of the NSW Work Health and Safety Regulations 2011.
- Prior to any task commencing that involves work on electrical plant and equipment, the contractors involved with the work will assess the risks associated with the task and identify the appropriate risk controls which will then be incorporated into a Safe Work Method Statement (SWMS) or Job Safety Analysis (JSA). The contractor and all the workers involved with the task will sign off on the SWMS or JSA.
- Risk assessments will consider isolation of all energy sources that could potentially impact the contractor's workers undertaking the task not just the immediate equipment being worked on, for example other equipment operating in the vicinity.

### 5.2 General Requirements for Electrical Work

IFS will oversee these general requirements which will apply to managing electrical equipment safely:

- All electrical equipment maintenance and installation will only be undertaken by competent contractors and their workers;
- Each exposed part of electrical equipment is to be treated as if it is energised until it is isolated and it is proven not to be energised i.e. TEST before touch;
- Electrical switchboards and all isolators for de-energising electrical circuits and other energy sources will be labelled;
- All enclosures housing electrical equipment such as substations and switchboards will be fitted with locks and signs to prevent access by unauthorised persons;
- Only competent and authorised personnel will be permitted to access electrical installations such as substations and switchboards;
- Wherever possible the space around electrical installations and circuits will have sufficient clearance for safe working conditions;
- Sufficient light will be installed in the vicinity of electrical installations and circuits to be able to see clearly all labels and markings;

- IFS will have a plan for the maintenance of electrical equipment and installations which will be compliant with manufacturer's instructions.

### 5.3 Residual Current Devices (RCDs)

- All mains powered portable equipment, operating at above extra low voltage, will be protected by an RCD;
- It is preferred that RCD's be part of a fixed installation, e.g. mounted within a switchboard, or integral to a switched socket outlet;
- Where this is not practical with existing installations then portable equipment will be connected to the electrical supply via an approved portable RCD unit;
- Portable RCD's will be registered, tested and tagged as with other portable equipment (see UON KRA 3.9 Electrical Testing and Tagging);
- The recommended minimum test frequency for portable and permanently installed RCD's is listed in the table below.

Type of Test	Portable	Fixed
Push button test, and visual inspection	Daily, or before each use, whichever is the longer	Twelve Monthly
Calibration check		Twelve Monthly

### 5.4 Flexible Extension Cords

The following risk controls for safe use of flexible extension cords will be implemented:

- Protected from accidental damage, e.g. pedestrians, vehicles, doorways, other pinch points such as being run through walls, ceilings or floors;
- Never used as a substitute for fixed wiring of a structure;
- Only used in continuous lengths without splicing or joining;
- Be visually inspected prior to use and be maintained in good working order;
- A portable RCD must be fitted to a portable extension cord or power tool where there is not a fixed RCD fitted at the relevant power outlet.

### 5.5 Live Work

From time to time a competent electrician is called upon to undertake activities which include working on or near live exposed low voltage electrical equipment. Live work includes:

- Working within 500mm of live exposed electrical conductors;
- Fault finding or testing on live electrical equipment e.g. the process of fault finding on energised equipment, but not working on the live equipment;
- Working on live electrical equipment e.g. replacement of a main circuit board on an energised 415 volt distribution board;

Working on live electrical equipment is a known high risk activity, exposing the person to possible severe burns and / or shock and such work should only be undertaken after other options have been considered and only in accordance with the SWMS or JSAs that have been developed by the contractor and the workers in consultation with IFS or the nominated responsible person. Specific procedures will include:

- Conducting a risk assessment to identify whether there is an alternative way of doing the work;
- Working under a Permit to Work issued by IFS or the nominated representative;
- Working with a stand-by person who has been trained in live rescue and CPR;
- Use of insulated tools;
- Provision of appropriate equipment to protect against arc flash or accidental contact with live equipment e.g. cotton clothing; non-conductive footwear, face shields; insulated gloves; non-conductive safety mats.

## **5.6 Electrical Arc Protection**

While working near live electrical equipment for testing and fault finding, a fault current of up to 20 times the rated current of the supply transformer can flow for short times during fault conditions.

Arcs that are produced under these conditions have the energy to cause an explosion and/or melt metallic switchboard cabinets. Arcs may cause severe burns to the skin and/or burns to the face and eyes. Inhaled hot gasses and molten particles can cause serious internal burns to the throat and lungs. Injury can also occur through the impact from flying debris and dislodged components. Over current circuit protection (e.g. RCDs) may not operate in such circumstances.

The safest way to address maintenance and repair situations with electrical equipment is to work only when equipment is de-energised using energy isolation procedures (see Section 5.7). When energy isolation has occurred, no electrical energy is present, no arc flash hazard exists, and no arc flash precautions are necessary.

When working on or near de-energised electrical equipment is not possible (see Section 5.5) arc flash protection will be provided to protect contractors who are working on or near the live electrical equipment. Arc flash protection equipment includes the following:

- For low voltage work (i.e. 415V AC) insulated tools will be used;
- Personal protective equipment (PPE) compliant with Australian Standards which may include:
  - Safety hat with face shield;
  - Anti-flash safety glasses/face shield;
  - Insulating gloves;
  - Safety boots;
  - Insulated sheeting;
  - Fire resistant clothing e.g. pants, shirts, overalls.

### **5.7 Excavation and Ground Penetrations**

Excavations and digging can include trenches and ground penetration such as drilling and digging drainage channels. Therefore it is essential that before work commences, up to date services diagrams will be consulted to identify the existence and location of underground electrical cables. See UON KRA 3.4 Excavation and Demolition for the procedures to be followed when excavations and ground penetration is to occur.

### **5.8 Energy Isolation**

Energy sources will be isolated whenever workers are required to work in and around energised equipment regardless of the source of energy. The following requirements apply and will be overseen by IFS or the nominated representative:

- Isolation will always be undertaken at the energy source and will not rely on control circuitry such as stop switches, interlocks, emergency stops or lanyards;
- Positive isolation will be used i.e. the energy source has been isolated, tested and the isolation is proved to have worked;
- Wherever practicable, isolation will be secured by the use of a personal locking device which requires a key for removal;
- The equipment will also be tagged at the control panel to indicate it is isolated;
- Prior to work commencing the equipment will be tested to verify it has been isolated;

- If a personal locking device cannot be used, a personal danger tag will be used instead by each worker involved with the job. The danger tag indicates that the person identified on the tag is involved in the work related to the item of equipment and is at risk of personal harm if the equipment is re-energised while the danger tag is in place;
- A personal danger tag will only be removed from the isolation point by the person identified on the tag who placed it on the isolator;
- De-isolation and re-energising of equipment will only occur when all personal locks or danger tags have been removed;
- If for any reason the person identified on a personal danger tag is not available to remove it when the work is completed, it will only be removed by an authorised person at the site after following these actions:
  - Inspecting the area;
  - Making personal contact with the tag owner, in person or by phone; or
  - Seeking reliable information from a third party that the person has left the area.

### **5.9 Out of Service Tags**

An out of service tag is used to indicate an item of equipment is defective and that the equipment will not be used until cleared for safe operation by an authorised and competent person. The following requirements apply to out of service tags:

- An out of service tag will be placed on all defective equipment as soon as the defect has been recognised;
- The item of equipment will not be used while the out of service tag is in place. The tag will remain in place at all times while the equipment is isolated, defective or being worked on;
- The tag will indicate the date and time that it has been applied and the name of the person who placed the tag;
- An out of service tag will only be removed by a competent person once the defect has been corrected.

### **5.10 Electric Shock**

Whenever electrical work is to be conducted procedures will be in place so that immediate action can be taken if a worker sustains an electric shock during the course of their work.

The following actions will be taken:

- A sufficient number of first aiders will be available whose training includes CPR and pole rescue;
- All workers who have sustained an electric shock will be taken for immediate medical assessment and monitoring to ensure there have been no cardiac or other complications;
- Electrical events will be reported by the contractor to IFS or the nominated representative who will enter the incident into the UON online Incident Management System (IMS). UON will ensure that the contractor reports the incident to the NSW WorkCover Authority;
- An investigation will be conducted following all electrical incidents.

## 6. References

[NSW Work Health and Safety Regulations 2011.](#)

[NSW WorkCover Managing Electrical Risks in the Workplace Code of Practice](#)

[UON H&S Framework](#)

[UON HSP 4.1 H&S Risk Management](#)

[IFS Permit to Work Procedure](#)

## 7. Attachments

Nil

## Document Control Table

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