

WHS Guidelines - Installation, Construction, Modification, Repair and Use of Electrical Equipment in the School of Physics.

1. Scope

This document applies to all areas where electrical equipment (plant, equipment, instruments, appliances or tools) is used within the School of Physics. This includes workshops, laboratories, field stations, and other environments, and covers equipment that has been either purchased, repaired, modified or manufactured. The purpose of this document is to provide information to assist personnel when conducting risk assessments, developing Safe Operating Procedures, and writing associated documentation.

2. Introduction

A wide variety of electrical equipment is used within the School of Physics. Misuse can result in injury to the user and/or others, and damage to the equipment or work. Proper training, correct selection & usage of equipment, appropriate precautionary measures, as well as good housekeeping are essential in these areas to alleviate or minimize danger.

When conducting risk management activities, people with WHS responsibility should:

- Ensure that minimum requirements are in place
- Use their expertise and the hazard summary table below to identify any hazards in the environment and implement appropriate mitigation strategies in order to reduce risks to the lowest most practicable level

3. Definitions

- **Extra low voltage** means voltage that does not exceed 50 volts alternating current (50 V AC) or 120 volts ripple-free direct current (120 V ripple-free DC).
- **Low voltage** means voltage that exceeds extra-low voltage and does not exceed 1000 volts alternating current (1000 V AC) or 1500 volts direct current (1500 V DC).
- **High voltage** means voltage that exceeds low voltage.
- An **electrical installation** is the electricity supply to a building, and includes the main switchboard, distribution switchboards, sub-switchboards and all associated fixed wiring including final sub-circuits, such as socket-outlets, isolation switches, lights, etc.
- **Electrical work** means installing, removing, adding, testing, replacing, repairing, altering or maintaining electrical equipment

- **Electrical equipment** means any apparatus, appliance, cable, conductor, fitting, insulator, material, meter or wire that is used for controlling, generating, supplying, transforming or transmitting electricity at a voltage greater than extra-low voltage

4. Minimum Requirements

- Electrical work is not be carried out on low or high voltage electrical equipment while it is energised, except under the conditions below.
- Electrical work on low or high voltage electrical equipment that is energised (i.e fault finding) is only to be conducted by people with suitable competency based qualifications (e.g., qualified electrician or an electronics certificate from TAFE) or by people who have passed the School's competency based training and tests.
- Electrical equipment that has been repaired, modified or constructed must be inspected and PAT tested by a qualified person before being energised or returned to service.
- School personnel are not permitted to work on electrical installations.

5. Hazard Summary Table

The hazard summary table below only lists common hazards and does not necessarily cover all hazards associated with electrical work. Personnel conducting risk management activities should determine if other hazards are present and implement mitigation strategies as required.

Hazard	Possible consequences	Mitigation Options
Electric shock	Serious injury or death	<ul style="list-style-type: none"> – Only competent people are to manufacture, modify or repair energised electrical and electronic equipment (plant). – Ensure repaired, constructed or modified equipment is inspected and PAT tested by a competent person before being energised or put into service. – Use or install RCDs at work benches or when working on electrical equipment. – Know how your circuits are labelled so equipment can quickly be de-energized in an emergency. – Install signage and restrict access to areas when working on energised electrical equipment. – Apply danger tags to equipment

		under repair.
Fire	Serious injury or death	– Ensure repaired, constructed or modified equipment is inspected and PAT tested by a competent person before being put into service.
Explosion	Serious injury or death	– Only competent people are to manufacture, modify or repair electrical equipment (plant) that uses high currents (>20amps).

6. Hazard Description

(a) Electric shock

When repairing, modifying and especially testing energised electrical equipment there is a significant risk of electric shock. Currents as low as 60mA can be fatal if they pass through the heart, but due to the multiplicity of available paths for current and the variable resistance of the human body it is very difficult to predict the severity of an electric shock so a "worst case" approach should be used. Mitigation relies primarily on training - correct procedures if followed reduce the risk of electric shock to an extremely low level. Suitably insulated tools should be provided for protection against accidental contact with live conductors. Areas where repair, construction, or modification of electrical equipment takes place should be fitted with a Residual Current Detector (RCD) and be tidy.

Repaired, constructed or modified equipment should be inspected and PAT tested by a competent person before being put into service.

(b) Fire

Electrical equipment can start fires if they are damaged or improperly repaired, so all maintenance, repairs, modification or manufacture must inspected and PAT tested by a competent person before being energised or returned to service.

(c) Explosion

Plant that uses high current is at some risk of explosion. Ensure that all high current connections are securely and appropriately tightened, and that cables and components are securely anchored to prevent movement. All work must be done by a competent person.

7. General Information

(a) Access

- Access to laboratories and technical environments should be controlled and only be granted after a safety induction has been completed and recorded.
- Access to dangerous electrical equipment should be restricted. Keep doors locked and posted with hazard warning signs to prevent unauthorized access. Post warning signs on anteroom and corridor doors. Post a warning sign which includes specific hazard warnings near equipment which may present a risk of RF exposure.

- Supervision may be required depending on the experience and attitude of the user and the risk and difficulty of the task. Supervision should continue until the supervisor is satisfied that the user can perform the task properly & safely on their own.
- Persons supervising others in these areas should have sufficient time, appropriate qualifications and experience, and always be available in the vicinity of the work area.

(b) Housekeeping

- Ensure that power cords do not cause a trip hazard.
- Ensure that power cords or extension cords are not left switched on when the user leaves the area.
- Equipment should not be left on when not attended for extended periods.

(c) Specialised Equipment

- This section refers to all specialised apparatus either purchased, custom made, or modified, used in research & teaching areas.
- Hazards additional to those mentioned above may be found in association with specialised equipment. They may include high electric power (high voltages and/or currents), RF, stored electrical energy (e.g. capacitors), stored potential energy (springs, weights at a height etc) radiation, lasers, magnetic fields, pressures, vacuums, extreme high/low temperatures, biological hazards, unusual gases/fluids etc. Due care should be exercised where these or any other hazards are present.
- Only qualified or suitably trained persons should use specialised equipment, and must be listed as an authorised user after verification of qualification.

See also School of Physics guidelines on safety in laboratories and technical areas, and guidelines on RF safety.

<http://www.scribd.com/doc/40667324/Safety-Handbook-2004>

(d) Other information

- Be aware of electrical hazards. Keep electrical panels clearly visible and unobstructed. Make sure cables, wires, and conduits do not create trip hazards. Know how your circuits are labelled so equipment can quickly be de-energized in an emergency. Design and maintain custom-fabricated equipment only in accordance with School of Physics and University guidelines.
- Use equipment only for the purpose it was designed and within its specified capacity limits.
- Ensure all safety features are fitted and operable.
- Use appropriate Personal Protective Equipment (PPE) when necessary.
- Report any damage to or faults with equipment. Do not use until repaired.
- Develop Safe Operating Procedures (SOP) in accordance with School of Physics guidelines, and ensure that all users are aware of them. Undertake Risk Assessment to aid in this process. Refer to specific documents on the School of Physics OHS website dealing with particular hazards where present. Some equipment may also require Emergency Control Procedures.
- Ensure users read SOP for the particular equipment prior to use and comply with them.
- Never attempt to alter or modify the equipment without first seeking approval.
If equipment is modified amend the SOP as necessary.