# ELECTRICAL SAFETY STANDARDS

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1 INTRODUCTION

At the University we interact with electrical installations and use thousands of plug-in electrical devices every day. The majority of electrical installations and equipment has been designed to protect us from exposure to electricity. However, the use of damaged or faulty electrical equipment can pose significant electrical risks. The most common electrical risks are the potential for electric shock causing injury or death and fires resulting from electrical faults.

2 PURPOSE

This document provides a framework for the management of electrical risks associated with University activities. The University performance standards and associated guidance detail a range of specific risk controls.

These standards give effect to the Work Health & Safety Policy 2016. Compliance with these University performance standards and procedures assists the University to meet the specific legislative requirements of the NSW Work Health & Safety Act and Regulation 2011.

3 SCOPE

These performance standards and procedures apply to all University staff, students, affiliates and contractors, and all activities undertaken by and on behalf of the University.

This document does not address the risks associated with electrical work carried out by electrical contractors. Refer to the CIS Contractor Induction Handbook for information regarding the requirements for electrical work.

4 UNIVERSITY PERFORMANCE STANDARDS

1. All electrical switchboards, including local distribution boards, are secured from unauthorized access
2. RCD protection will be provided at the distribution boards for all lighting and power circuits
3. All electrical work is authorised by Campus Infrastructure & Services (CIS)
4. Electrical faults are reported to CIS via the Campus Assist Helpdesk (or Campus Assist Online)
5. Electrical work is only carried out by licensed electricians
6. Plug-in electrical equipment is regularly visually inspected by the equipment users
7. Plug-in equipment that is likely to be damaged during normal use is identified and subject to electrical testing and tagging (ETT)
8. Plug-in equipment that fails a visual inspection or ETT is immediately disconnected from the electricity supply and removed from service
9. Faulty items that remain in the workplace are clearly tagged “out of service”
10. Repaired equipment is re-tested and tagged prior to re-introduction to service
11. The use of double adapters and piggy back plugs are prohibited
12. The use of power boards and extension cords is actively minimised
13. Medical electrical equipment that is intended to be connected to patients, research participants or students, must be maintained in accordance with AS/NZS 3551:2012
14. Any manufacture or modification of electrical equipment is carried out by a competent person and subject to a design risk assessment and ETT prior to commissioning.
5 DEFINITIONS

**competent person**
A person who possesses the necessary practical and theoretical skills acquired through training, qualification, experience or a combination of these, to correctly undertake the tasks described in this guideline. A competent person is not required to be a registered or licensed electrical practitioner.

**electrical installation**
Infrastructure that supplies electricity to a building, including the main switchboards, distribution boards, metering, fixed wiring, socket outlets, and fixed electrical equipment.

**electrical work**
Connecting electrical supply wiring to electrical equipment or disconnecting electrical supply wiring from electrical equipment. Installing, removing, adding, testing, replacing, repairing, altering or maintaining an electrical installation is also considered to be electrical work.

**socket outlets**
A fixed or suspended power outlet for connecting an equipment plug.

**PAT**
A portable appliance tester. An electronic instrument that automatically tests equipment plugged into it.

**RCD**
A residual current device. An electrical safety device designed to isolate and immediately switch off the supply of electricity when electricity is detected to be leaking to earth at harmful levels.

6 RESPONSIBILITIES

6.1 CAMPUS INFRASTRUCTURE & SERVICES (CIS)

Campus Infrastructure & Services (CIS) are responsible for:

- Safe design, construction, installation, monitoring and maintenance of the University’s electricity infrastructure
- Security of electrical switchboards
- Installation and testing of fixed RCD protection
- Provision of Electrical Testing and Tagging (ETT) services
- Authorisation of all electrical work.

6.2 DEANS, DIRECTORS, HEAD OF SCHOOLS (OR EQUIVALENT)

Deans, directors and heads of school (or equivalent) are responsible for ensuring that these electrical safety performance standards and the associated procedures are implemented within their area of control. This includes ensuring that electrical work is not arranged without prior authorization of CIS.

6.3 SUPERVISORS

University supervisors are required to ensure that:

- Electrical faults are reported to CIS
- Staff, students and visitors do not attempt to access electrical switchboards
- Plug-in electrical equipment is regularly visually inspected for obvious faults
SAFETY HEALTH & WELLBEING

- Plug-in equipment that is likely to be damaged during normal use is identified and made available for testing by the CIS managed ETT contractor
- ETT contractor staff are provided with appropriate induction and supervision whilst working in their area of control
- Faulty electrical equipment is immediately removed from service
- Their area of control has sufficient socket outlets to minimise the use of power boards and extension leads
- Any manufacture or modification of electrical equipment for university use is carried out by a competent person and subject to design risk assessment and ETT prior to commissioning.

6.4 WORKERS

Workers are required to:

- Report electrical faults to their supervisor
- Visually inspect electrical equipment, plugs, leads and socket outlets for obvious damage prior to use
- Use the correct electrical equipment for the specific task
- Immediately remove faulty (or suspect) items of electrical equipment from service.

7 MANAGING ELECTRICAL SAFETY

7.1 ELECTRICAL INFRASTRUCTURE

7.1.1 ACCESS TO ELECTRICAL SWITCHBOARDS

Access to University electrical switchboards and distribution boards is restricted to CIS approved electrical contractors and electrical engineers.

Most circuits are protected by circuit breakers to prevent overloading. Reports of tripped circuit breakers and requests to reset tripped circuits or RCDs must be made to the Campus Assist Helpdesk 1300 226 787. Tripped circuit breakers, RCDs and other electrical devices must not be re-energised until the reason for their operation has been identified and the fault has been rectified.

7.1.2 INSTALLED RCD PROTECTION

Serious injuries and fatalities can be prevented by the use of RCDs, commonly referred to as “safety switches”. RCDs are typically provided at the electrical distribution board for lighting and power circuits. In some situations, RCDs are installed at the socket outlet.

The auditing of electrical distribution boards, the installation of new RCD protection, and the inspection and testing of existing RCDs is an ongoing maintenance process. This process is carried out by CIS appointed electrical contractors in accordance with AS/NZS 3760:2010.

7.1.3 EMERGENCY STOP BUTTONS

Emergency stop buttons that isolate the electrical supply should be incorporated into the design of all new laboratories and workshops. The emergency stop buttons must be easily accessible and clearly labelled.
7.2 INSPECTION & TESTING OF ELECTRICAL EQUIPMENT

Regular inspection and testing of plug-in electrical equipment assists in determining whether or not the equipment is electrically safe for use.

7.2.1 VISUAL INSPECTION PROCEDURES

Supervisors must ensure that plug-in electrical equipment is regularly visually inspected for obvious faults. Regular visual inspections can identify obvious damage, wear or other conditions that may make the equipment unsafe. The majority of electrical defects are detectable by visual inspection.

7.2.1.1 Frequency of visual inspections

- New equipment must be visually inspected prior to first use
- Infrequently used equipment must be visual inspected prior to each use
- Regularly used equipment that is not subject to ETT must be visually inspected annually.

7.2.1.2 Visual inspection checklist

The visual inspection process should include a check for:

- Obvious damage, defects, make-shift repairs or modifications
- Discolouration that may indicated exposure to excessive heat, moisture or chemicals
- Damage to flexible cords, e.g. confirm they are intact and flexible
- Effective anchoring of the flexible leads to the equipment and plugs
- Condition of the operating controls (e.g. buttons, switches, dials) - secure, aligned and labelled
- Missing external covers or guards.

7.2.1.3 Removal of old tags

If a piece of equipment has been previously tested and tagged, but it has since been determined that it no longer requires regular ETT (refer to Section 7.2.2), the old tag must be removed.

7.2.1.4 Potentially unsafe equipment

Potentially unsafe equipment must be immediately removed from service by one of the following methods:

- Cutting the plug off and disposing of the item in an appropriate waste stream
- Applying an out-of-service tag to the piece of equipment, pending further inspection, repair and testing.

7.2.2 ELECTRICAL TESTING AND TAGGING PROCEDURES

Section 150 of the NSW Work Health & Safety Regulation 2011 requires that plug-in electrical equipment is regularly inspected and tested by a competent person if the equipment is subject to operating conditions that are likely to cause damage to the equipment.
CIS provide an ETT service via a contractor that moves from building to building using a PAT to test and tag plug-in electrical equipment that meets this description.

### 7.2.2.1 Identifying equipment for electrical testing & tagging (ETT)

It is the responsibility of the local supervisor to identify equipment for testing. The decision tree in Appendix A and the examples in Appendix B have been provided to assist with the identification of plug-in electrical equipment that requires ETT.

Priority is given to equipment that fits one or more of the general or environmental risk factors listed below.

**General risk factors**
- Hand held – moved during use
- Portable – frequently moved from one location to another
- Supply cord is subject to abuse
- Supply cord is subject to frequent flexing

**Environmental risk factors**
- Moisture – used in a wet area, outdoor use or storage
- Dust – used in a dusty environment
- Heat - positioned adjacent to a heat source
- Corrosive environment
- Vibration
- Mechanical damage – impact

### 7.2.2.2 Tagging of tested equipment

A durable, water resistant and self-adhesive tag will be applied to all electrical equipment that successfully passes a PAT test. The tag will note the following information:

- Name of the person and company that carried out the test
- Date of the testing
- Outcome of the testing
- Date on which the next testing must be carried out.

### 7.2.2.3 Tagging Out Faulty Electrical Equipment

Electrical equipment that fails a PAT test will be immediately removed from service by one of the following methods:

- Cutting the plug off and disposing of the item in an appropriate waste stream
- Applying an Out-of-Service tag to the piece of equipment, pending further inspection, repair and testing.

Common low cost electrical items, e.g. power boards and power leads will immediately be disposed of, while more expensive or specialist equipment may warrant repair. These decisions will require consultation with the supervisor of the area. If it is unclear how best to proceed, the ETT Service will apply an Out-of-Service tag.
7.2.2.4 Frequency of testing

ETT services will be provided annually. A small number of areas including some mechanical workshops will be provided with ETT services once every six months.

7.2.2.5 New equipment

Where new equipment is introduced to the workplace, the supplier is responsible for providing a safe product and therefore electrical testing and tagging is generally not required. The equipment should be visually inspected prior to first use.

7.2.2.6 Repaired equipment

Equipment that has been repaired or serviced must be tested and tagged by the repairer prior to being reintroduced to service.

7.2.2.7 Second hand equipment

Where second hand electrical equipment is introduced to the workplace, the equipment must be tested and tagged prior to first use. This can be arranged through a service request on Campus Assist Online.

7.2.2.8 Personal electrical equipment

Personal electrical equipment that is genuinely used for University business will be tested, following approval of the supervisor. Personal electrical equipment not used or required for University business will not be tested and the relevant staff will be asked to remove the equipment from the workplace.

Common personal items including mobile phone chargers will not be tested. These items must be regularly visually inspected by the owner and removed from the University if there is any sign of damage or fault.

Personal electrical equipment used in student accommodation will not be subject to ETT processes. However, students may be asked by a senior resident or other University representative to dispose of or remove faulty or damaged equipment.

7.2.2.9 Electrical equipment not able to be tested with a PAT

Electrical equipment requiring testing that is not able to be tested with a PAT (e.g. three phase equipment) must be tested and tagged by a licensed electrician in accordance with AS/NZS 3760:2010.

7.2.2.10 Record keeping

Records will be captured during the testing process by the ETT contractors engaged to complete the testing. The records will be maintained in three ways:

1. Tag applied to the equipment following the testing
2. University database of all equipment tested (maintained by CIS)
3. Equipment owners will be provided with a copy of the database output for their delegated area of responsibility so they can maintain records of repair and disposal.
### 7.3 IMPORTED ELECTRICAL EQUIPMENT

Imported electrical items may not meet Australian safety standards and can pose a serious safety risk. [Australian product safety laws](#) include specific requirements for electrical products. If imported directly, e.g. purchasing overseas products over the internet, electrical items must be certified as compliant with Australian safety standards, as determined by the electrical safety regulator, [NSW Fair Trading](#).

### 7.4 REPAIR OF ELECTRICAL EQUIPMENT

Electrical equipment must be repaired by a competent person and subject to ETT prior to being reintroduced to service (Ref. Section 7.2.2.6).

### 7.5 DESIGN AND COMMISSIONING OF ELECTRICAL EQUIPMENT

Prior to commissioning, all in-house designed, manufactured or modified electrical equipment that uses or generates voltages above extra low voltage ( >50 Vac or >120 Vdc) must undergo a design risk assessment process undertaken by competent persons in accordance with the requirements of AS/NZS 3100:2009.

### 7.6 MEDICAL ELECTRICAL EQUIPMENT

AS/NZS 3760:2010 specifically excludes medical devices and electrical devices in patient care areas. Medical electrical equipment intended to be connected to patients, research participants or students must be designed and certified to meet the requirements of AS/NZS 3200 and maintained in accordance with AS/NZS 3551:2012.

The inspection, testing and maintenance of medical electrical equipment are the responsibility of the faculty, school or research institute that owns the equipment.

### 7.7 WORKING WITH ELECTRICAL EQUIPMENT

#### 7.7.1 LOCATION OF ELECTRICAL EQUIPMENT

Electrical equipment can be a source of ignition and must be separated from potentially flammable or explosive environments. For further information refer to AS/NZS 2381.1:2005 Electrical equipment for explosive gas atmospheres – Selection, installation, and maintenance.

Fume Cupboard socket outlets must only be used for electrical equipment used within the fume cupboard.

Electrical equipment must be separated from wet areas. Consider using battery or air powered equipment when working in damp environments.

#### 7.7.2 USE OF ELECTRICAL LEADS

Extension leads must be compliant with AS/NZS 3199 Approval and Test Specification for Cord Extension Sets. When in use, extension leads must be:

- Selected so that the shortest practical lead is used for the task
- Fully extended
SAFETY HEALTH & WELLBEING

- Connected to the nearest socket outlet and removed from the socket outlet immediately when not in use
- Protected from mechanical damage
- NOT placed where they could be a trip hazard (e.g. across aisles, corridors or other trafficable areas).

### 7.7.3 USE OF POWER BOARDS

Power boards used at the University must comply with AS/NZS 3105 Approval and Test Specification for Electrical Portable Outlet Devices. Power boards at the University must have the following design features:

- Current overload protection
- Reset button
- Individual switches on the power board (for power boards with a lead longer than 1.8m).

Power boards are designed for temporary use only. In office environments power boards must be located in an area which does not cause damage to the board or create a trip hazard. In all other locations they must be securely mounted clear of the work-bench or floor. The use of power boards in laboratories is discouraged and should be prohibited in new laboratories where sufficient socket outlets have been provided.

#### 7.7.3.1 Insufficient socket outlets

Power boards are designed for temporary use in situations where additional power plugs are required. In situations where additional socket outlets are required on an ongoing basis a request for the installation of additional socket outlets should be made via Campus Assist Online.

#### 7.7.3.2 Prohibitions

- Power boards must not be piggy backed, e.g. a power board cannot be plugged into another power board. This can result in extreme fire risk.
- Double adaptors and piggy-back plugs are prohibited for use in the University. These are not to be used under any circumstances.

### 7.7.4 USE OF RESIDUAL CURRENT DEVICES (RCD)

Serious injuries and fatalities can be prevented by the use of RCDs, commonly referred to as “safety switches”. RCDs are typically provided at the electrical distribution board for lighting and power circuits, but are not currently installed in all areas.

The use of portable RCDs is recommended in higher risk work environments where installed RCD protection is not currently available. The purchase and regular testing of portable RCDs are the responsibility of the organisational unit responsible for the area and/or activities.

Correct selection of the type of earth leakage protection is also important to avoid an unacceptable level of circuit tripping by the devices. The minimum requirement for an RCD is a tripping current which does not exceed 30 milliamps with a tripping time less than 200 milliseconds when electricity is supplied through a socket outlet not exceeding 20 amps.

An RCD is a valuable safety device, never bypass it. If the RCD trips it is a sign there is a fault. The users should contact CIS to arrange an electrical contractor to investigate and rectify the problem.
Note - RCDs do not provide protection in all circumstances. For example, an RCD will not trigger if a person contacts both active and neutral conductors while handling faulty plugs or electrical equipment and electricity flows through the person’s body, unless there is a current flow to earth.

7.8 ELECTRICAL INCIDENTS

7.8.1 REPORTING ELECTRICAL INCIDENTS

Any incident or injury involving electricity must be immediately reported to the local supervisor and Safety Health & Wellbeing. As soon as reasonably possible a formal incident report must be entered via RiskWare.

All electrical incidents are reportable to WorkCover NSW. Safety Health & Wellbeing manage the notification process.

7.8.2 MEDICAL ATTENTION

It is important that any person who has suffered an electric shock, no matter how minor, seeks medical attention as soon as possible after the event. Contact with electricity can have serious health effects that may be delayed.

7.8.3 MAKE SAFE

CIS will be contacted and requested to send an electrical contractor to inspect the electrical installation and/or the socket outlet and equipment involved in the incident. Equipment involved in an electrical incident will be removed from service pending further inspection and testing.

8 REVIEW AND EVALUATION

These performance standards and the associated procedures and guidelines will be reviewed by Safety Health & Wellbeing at least once every two years to identify and implement opportunities for improvement.

9 REFERENCES

- NSW Work Health and Safety Act 2011
- NSW Work Health and Safety Regulation 2011
- WorkCover Code of Practice – Managing Electrical Risks in the Workplace, 2015
- AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment
- AS/NZS 5762:2011 In-service safety inspection and testing – Repaired electrical equipment
- AS/NZS 3105:2012 Approval And Test Specification - Electrical Portable Outlet Devices
- AS/NZS 3551:2012 Management Programs for Medical Equipment
- AS/NZS 3100:2009 Approval and test specification – General requirements for electrical equipment
- AS/NZS 3200.1.0:1998 Medical electrical equipment – General requirements for safety
- AS/NZS 3200.1.1 Approval and test specification – Medical electrical equipment
## 10 DOCUMENT CONTROL

### Acknowledgements

### Related Documents

- University of Sydney Work Health & Safety Policy 2016
- University of Sydney Work Health & Safety Procedures 2016

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<td>Director, Safety Health &amp;</td>
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*Printed copies of this document are uncontrolled. Verify version before using.*
APPENDIX A – IDENTIFICATION OF EQUIPMENT REQUIRING ELECTRICAL TESTING AND TAGGING (ETT)

Electrical Testing and Tag Decision Tree

Local assessment of electrical equipment

Is the equipment subject to damage during normal use?
- Yes
  - Refer to the general risk factors
  - Inspection and Testing by ETT contractor
- No

Is the equipment used in a hostile environment?
- Yes
  - Hostile environment risk factors:
    - Moisture e.g. used in a wet area
    - Heat, e.g. positioned adjacent to a heat source
    - Subject to vibration
    - Mechanical damage, e.g. at risk of impact or wear
    - Used in close proximity to corrosive chemicals
    - Operated in a dusty environment
  - Inspection and Testing by ETT contractor
- No

Is the equipment exposed to any of the hostile environment risk factors?
- Yes
  - Inspection and Testing by ETT contractor
- No

Potential Hostile Environments
- Workshops
- Laboratories
- Art studios
- Shared kitchen facilities
- Clinical treatment areas
- Equipment used outdoors

General risk factors
- Hand held - moved during use
- Portable – frequently moved from place to place (plug in/out)
- Supply cord is subject to frequent flexing
- Equipment or supply cord is subject to abuse

Visual inspection checklist
- Look for any obvious damage or defects to the equipment including discoloration that may indicate exposure to heat, moisture or chemicals
- Check that the outer sheath of the supply cord is not damaged
- Flex the supply cord to confirm that it is not brittle
- Check there are no exposed wires at plug - the outer sheath must cover the inner wires right into the plug
- Confirm that the lead works correctly - connect the equipment and check that it switches on normally

Frequency of ETT Service
- Workshops will be serviced 6 monthly
- All other work areas will be serviced annually

Frequency of Visual Inspections
- Equipment owners are encouraged to visually inspect electrical equipment before each use
- Specific reminders to inspect low risk equipment will be issued prior to and during the annual ETT process

Record Keeping
- ETT contractors will generate a database of equipment tested
- The data will be managed by GIS
- Local data will be provided to faculties/schools post testing

New items of Electrical Equipment
- New equipment does not require testing prior to first use, but must be visually inspected for obvious faults
- Second hand electrical equipment must be tested prior to first use. Arranged via Campus Assist Online

Monitoring Compliance
- Compliance will be monitored via regular Workplace Inspections

WHS_ELE_STD_1_Electrical Safety Standards
## APPENDIX B – TYPICAL ELECTRICAL EQUIPMENT

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<th>Work Environment</th>
<th>Does require regular testing and tagging</th>
<th>Does not require testing and tagging</th>
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<tr>
<td><strong>Kitchens</strong></td>
<td>• Toasters/sandwich machines</td>
<td>• Refrigerators</td>
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<td>• Kettles</td>
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<td></td>
<td>• Coffee machines/grinders</td>
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<td>• Plug-in hot water heaters</td>
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<td><strong>Workshops</strong></td>
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<td>• Power boards</td>
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<td>• Power leads</td>
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<td>• Portable projectors</td>
<td>• Freezers</td>
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<td>• Overhead projectors/visualisers</td>
<td>• Biosafety cabinets</td>
</tr>
<tr>
<td><strong>Offices</strong></td>
<td>• Portable power leads</td>
<td>• Incubators</td>
</tr>
<tr>
<td></td>
<td>• Portable power boards</td>
<td>• Desktop computers</td>
</tr>
<tr>
<td></td>
<td>• Portable projectors</td>
<td>• Free standing centrifuges</td>
</tr>
<tr>
<td></td>
<td>• Electronic whiteboards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Electric heaters</td>
<td></td>
</tr>
<tr>
<td><strong>Equipment used Outdoors</strong></td>
<td>• Power leads</td>
<td>• Laptop computers</td>
</tr>
<tr>
<td></td>
<td>• Power boards</td>
<td>• Desktop computers</td>
</tr>
<tr>
<td></td>
<td>• Laptop computers</td>
<td>• Printers</td>
</tr>
<tr>
<td></td>
<td>• Portable projectors</td>
<td>• Copiers</td>
</tr>
<tr>
<td></td>
<td>• Monitoring equipment</td>
<td>• In-situ task lighting</td>
</tr>
<tr>
<td></td>
<td>• High pressure water cleaners</td>
<td>• Phone chargers</td>
</tr>
<tr>
<td></td>
<td>• Portable lighting</td>
<td>• Laptop docking stations</td>
</tr>
<tr>
<td></td>
<td>• Electrical gardening equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Portable RCDs</td>
<td></td>
</tr>
<tr>
<td><strong>Student Accommodation</strong></td>
<td>• All university owned plug-in electrical equipment.</td>
<td>Personal electrical items</td>
</tr>
<tr>
<td></td>
<td>• Plug-in kitchen appliances</td>
<td></td>
</tr>
<tr>
<td>No obvious damage or defects to equipment including discolouration that may indicate exposure to heat, moisture or chemicals.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>* Dust build up on power boards is a particularly common issue.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outer sheaths of supply cords aren’t damaged. Test cords by flexing to confirm that they’re not brittle*</th>
</tr>
</thead>
<tbody>
<tr>
<td>*If leads are in contact with absorbent materials, the plasticiser in the lead may be ‘leached out’ over time, making the P.V.C. coating hard and brittle and prone to splitting.</td>
</tr>
</tbody>
</table>

| Power boards in the area aren’t overloaded, i.e. piggy backed from one board onto another. This can result in extreme fire risk. |

| No evidence of exposed wires at plugs - the outer sheath must cover the inner wires right into the plug. |

| No signs of overheating, e.g. burn marks or distortion on leads, power boards or equipment. |
DANGER

ELECTRICAL HAZARD

AUTHORISED ACCESS ONLY

Access to this switchboard is restricted to CIS approved electrical contractors only

For a prompt response to electrical faults contact the Campus Assist Helpdesk 9351 7838