Risk assessment: use of standard electrical equipment

Laboratory supply of mains electricity is via individual socket outlets that may be 3-phase 415 V, 50 Hz, or single-phase 240 V, 50 Hz. Office supplies are normally 240 V, 50 Hz. Most electrical equipment operates on 240 V, 50 Hz.

A wide range of electrically powered equipment is found in the laboratory including fluid and vacuum pumps, centrifuges, power supplies, electrophoresis and electrochemical apparatus, stirrers, hot plates, ovens both conventional and microwave and computers, printers and visual display equipment. In the office, there are, amongst other things, computer equipment, fax machines and photocopiers. In the lecture theatres there are overhead and slide projectors.

Hazards

- Electric shock is the effect produced on the body and particularly on the nervous system by an electrical current passing through it. The effect depends on the current strength which itself depends on the voltage and body resistance i.e. path length and surface resistance of skin (which is much reduced when wet). Death can be the result of the normal voltage of 240 V causing currents of greater than 30 mA to flow through the body for more than 40 ms. Minor shocks may also cause injury following involuntary muscle contraction.
- Burns caused by the passage of heavy currents through the body or by direct contact with an electrically heated surface.
- Explosion and fire caused by electrical sparks, short circuits or overload heating, old wiring in the presence of flammable material.
- Injury from microwave and radio-frequency sources and from induction heating equipment.

Risks

Electrical equipment is in common daily use outside of the laboratory and users are normally familiar with safe operation. The risk of injury is therefore likely to be slight although any injuries that do occur may range from slight to fatal.

Who is likely to be injured?

Electric Shock: most likely the user themselves.

Fire and Explosion: injuries may be widespread.

Control Measures

These precautions are not meant to be exhaustive or to cover aspects of repair or construction of electrical equipment but to cover everyday use in the laboratory and office.

Plugs and fuses

- Plugs that are cracked or broken must not be used. The plugs must be wired properly, the conductors securely fixed and the cable firmly held by the strain relief grip.
The rating of the fuse must be appropriate to the appliance. Most electronic equipment
(computers, measuring instruments etc.) requires only a 3 A fuse which will load to
720 W. Reserve 13 A fuses (loading to 3000 W) for heavier equipment. Electronic
Workshop (Elektronikwerkstatt) personnel will advise in case of doubt.

Cabling

- The cable must be in good condition and free from breaks in the insulation. Cable
must be sufficiently robust to withstand the wear and tear of laboratory or office use
and fully waterproof where water may come within the vicinity of the apparatus.
- Particular care must be taken where electrical cable might be entrained/ cut by moving
parts even if the parts move only infrequently and to ensure that any cable is protected
or safely secured out of danger.
- Cables must not be run across the floor in such a way as to cause a tripping hazard or
to be susceptible to damage from passing traffic. If it is necessary to run cables across
walkways, they must be covered with cable protectors.

Extensions /Adaptors

It is permissible if necessary to feed one four way extension block from a single socket
provided the block feeds only low power equipment (less than 500 W or 2 A). Extension leads
must not be daisy-chained. Kettles, microwaves and heaters that have higher power demands
must not be used on such an extension but must be fed from an installed socket point.

Mains Switch

The location of any mains switch must be clear and known so that power can be turned off
rapidly in an emergency.

Use

- No apparatus with exposed mains terminals should ever be used.
- Ordinary electrical equipment must not be used in the vicinity of flammable or
explosive gases. Ordinary electrical equipment is a possible source of ignition.
- Ordinary electrical equipment must not be used where it may get wet. Water may
cause a dangerous short circuit.
- Equipment that has been wet must never be switched on until the equipment has been
tested. Anyone to whom the equipment is taken for testing must be informed about
what has happened.

Repairs

- Electrical equipment must not be "repaired" except by a competent person.
- Equipment must be disconnected from the main power before beginning.
- If there is any doubt, equipment should be taken to the Electronics Workshop for
repair.

Testing

Electrical equipment should be tested from time to time. **Apparatus that fails a safety test
must never be used.**
More sophisticated electrical work such as building custom equipment, the University Electronic Workshop personnel should be consulted.

Training

- The safe use of electrical equipment is part of the training of undergraduates.

⚠️ Risk Remaining

Mains electricity will always remain a potentially lethal hazard if mishandled. Following the precautions outline above, the risk remaining should be minimal.

Emergency Procedure

Electric Shock

- **Power must be switched off before touching the injured person.** Further procedure to be followed is given in the posting "NOTFALL/UNFALL".

Fire

- Procedures are described in the “**Brandschutzordnung der TU Kaiserslautern**” or in the posting “**Regeln für das Verhalten im Brandfall**”.
- Water must never be used on an electrical fire.