

Welcome to the Electrical and Electronics Module

Have you read the General Module, completed the test and printed your WorkSafe Smart Move General certificate?

The Electrical and Electronics Module should be done AFTER the General Module.

If it is some time since you have done the General Module you should read the Review Module. The test for this module includes some questions based on the Review Module.

There are common hazards in the electrical and electronics industry. It is important to learn about these hazards and how to work safely.

The Electrical and Electronics Module contains information on:

- Lock Out, Isolation and Tagging;
- Carrying Out Electrical Work;
- Residual Current Devices (RCDs);
- Hazardous Substances; and
- Personal Protective Equipment and Clothing.

Within this industry you may be involved in a range of work activities such as using measuring instruments, soldering, using hand, power and specialist tools and constructing circuits.

Key Point Only licensed electrical workers can legally perform electrical work.

This includes new electrical installations and alterations, and repairs to existing installations. An unqualified person should not be employed or allowed to undertake electrical work.

Key Point Apprentices and trainees must be supervised by a qualified electrical worker at all times.

Your employer must make sure you are properly trained and supervised and are given instructions for safe work procedures and equipment is in good working order.

It is important that you work in a safe manner, not only for your own safety but also the safety of others.



Lock Out, Isolation and Tagging

Isolation, tagging and lock out procedures are designed to protect people and property in a workplace from hazards related to electrical power, damaged equipment or machinery or when repairs, maintenance or inspections are carried out.

Before any repair or alteration work is started the electrical circuits or equipment to be worked on must be disconnected from the electricity supply, unless other adequate precautions are taken to prevent electric shock.

Lock out

Lock out is the best way of preventing machinery or electrical current becoming operational during maintenance. A lock is attached to the machine switch so that it cannot be turned on.

The employee working with the machine should hold the only key to the lock. A lock must only be removed from equipment or machinery by the person who attached it. Procedures must be put in place for the removal of the lock in case this person is not available, for example if there has been a change of shift workers.

Lock Out, Isolation and Tagging

Isolation and tagging

Before you start work:

- switch off;
- isolate circuits;
- fix appropriate tags;
- test that the electricity supply is isolated; and
- always test your test instruments.



Danger tags

Personal “DANGER” tags are colour coded red, white and black and are used while equipment and machinery is being repaired or serviced.

A “DANGER” tag on an item of equipment is a warning to all persons that the equipment is being worked on and must not be operated as lives may be placed in danger.

Key Point A circuit must not be energised while a “DANGER” tag is attached.

If turning on a switch or valve or operating any machinery or equipment you are working on will place you or someone else in danger you must fix your own “DANGER” tags. They must be tied on every main isolation switch or valve and you must make sure the switch is in the correct safe position before you start the job. When two or more employees are working on the same job they must each fix their own danger tag.

Lock Out, Isolation and Tagging

“DANGER” tags are for everyone’s safety. You must:

- sign and date the tag;
- only fix and remove your own “DANGER” tags;
- place tags at common isolation points;
- tie the tag securely; and
- remove your tag at the end of the shift or when the work is done.



Out of service tags

Yellow and black “OUT OF SERVICE” tags are used to warn people machinery, appliances or equipment is damaged, unsafe or out of service for repairs. They are used to prevent accidents and damage to the equipment or machinery.

Key Point

While an “OUT OF SERVICE” tag is fixed to machinery, appliances or equipment it must not be operated.

Lock Out, Isolation and Tagging

If you are required to fix “OUT OF SERVICE” tags, you must:

- be authorised to fix and remove them;
- write your name and the fault on all tags;
- place them in a prominent position;
- place tags at common isolation points; and
- leave tags on until the machinery or equipment is repaired and is safe to use.

Key Point Any faulty equipment should be tagged “OUT OF SERVICE” so that it cannot be used until it is replaced or repaired.

The safe work procedures for the removal of “DANGER” and “OUT OF SERVICE” tags at your workplace must be followed.

Talk to your employer or supervisor if you are unsure about tagging machinery and equipment correctly.

An example of the dangers of working with electricity is outlined in the case study *Electrician Electrocuted Installing Switch* (Significant Incident Summary 12/1995) WorkSafe’s web site at www.docep.wa.gov.au

Carrying Out Electrical Work

Carrying Out Electrical Work

Generally you should not work alone with machinery unless it has 'deadman' switches. This is a type of switch often used on electrical machinery. It is designed so that if the operator releases pressure on the switch, handle or pedal because of sudden illness or other causes the current is cut off and the machine ceases to operate.

If you must work alone, the machine's controls should be clearly marked so that another person who may not be familiar with the machine would be able to turn it off in case of an emergency.

Key Point Your employer must make sure you are trained in safe work procedures.

Safety Procedures for working with electricity might cover the following

Before you start work

- Plan and discuss the job.
- Take care and think about what is to be done.
- Confirm permission to isolate (use a permit system if relevant).
- Isolate the electrical equipment or circuit.
- Fit a "DANGER – DO NOT OPERATE" tag.
- Put up safety barriers when required.
- Use the correct earthing equipment.
- Cover and insulate live apparatus nearby.
- Check test instruments.
- Get authority to do the work.

Carrying Out Electrical Work

Avoid working on live equipment whenever possible. You should not wear bracelets, rings, neck chains, exposed metal zips or watches while carrying out electrical work near live electrical equipment.

Key Point Working safely includes the work procedure, the type of tools used and the type of clothing worn.

When Working

- Use safety observers when required.
- Never rely on your memory.
- Connect the earth and neutral conductors first.
- Check the isolation points before resuming work after a break.
- Use approved safety belts.
- Regularly check and clean the tools that you use.
- Use insulated ladders.
- Use non-conducting tape measures.

On Completion of Work

- Check that no tools are left on or in the job.
- Remove your own earthing equipment.
- Check that the work is complete and the equipment can be energised.
- Notify all personnel involved that the equipment will be energised.
- Hand in your work permit (if relevant).
- Remove “DANGER – DO NOT OPERATE” tags.
- Energise power supply.
- Remove and store all safety barriers.

Carrying Out Electrical Work



Safety Practices

- Know electric shock and resuscitation procedure.
- Keep a first aid kit handy.
- Check the first aid kit regularly.
- Know where the fire extinguishers are located and how to operate them.
- Know the correct type of fire extinguisher for the various types of fire.
- Keep your workplace clean and orderly.
- Report all electrical accidents.

Residual Current Devices

A Residual Current Device (RCD) or safety switch is an electrical safety device designed to immediately switch the electricity off when electricity “leaking” to earth is detected at a level harmful to a person using electrical equipment. RCDs are designed to operate within 10 to 50 milliseconds. They also reduce the risk of fire by detecting electrical leakage to earth in electrical wiring and equipment.

Key Point An RCD offers a high level of personal protection from electric shock.

If you are using portable electrical equipment, power tools and extension leads at work you must be protected against earth leakage by an RCD that is installed at a permanent switchboard or in a fixed socket outlet. This is required under the *Occupational Safety and Health Regulations 1996*.

Residual Current Devices significantly reduce the severity of electric shock, but will not protect you against all electric shock. For example, contact with both the active and neutral conductors causes electric current to flow through the body which will not be detected by the RCD unless there is also a current flow to earth.

Key Point RCDs are an addition to safety measures, not a substitute for them and they should be regularly tested and maintained.

Hazardous Substances

You may need to use **rosin fluxes** for metal soldering in the electrical and electronics industry.

Flux is a sticky liquid or paste used to react with and remove compounds from the surface of the connection to improve the flow of the molten solder and to prevent oxidation during the heating cycle.

Rosin flux may cause health problems if fumes are inhaled or if flux gets on your skin. Fumes may cause irritation such as watery, prickly eyes, running or blocked nose, sore throat, coughing, wheezing, tight chest and breathlessness. Skin contact may cause itchy skin and dermatitis. Skin contact usually happens when employees get flux on their hands while applying it to metal surfaces before soldering.

Your employer should control the health risks associated with rosin flux by

applying risk control steps in the following order of importance:

- **eliminating** soldering completely by crimping or twisting electrical wire connections if possible;
- **substituting** fluxes that do not contain rosin if possible, or using rosin core solder where the rosin is contained in a fine tube of solder, which is less likely to result in skin contact during hand soldering;
- **extracting** rosin fumes by a local extraction exhaust system or a fume cabinet connected to an exhaust system;
- **limiting the amount of time** an employee spends doing soldering work; and
- **providing personal protective equipment and clothing**, such as suitable gloves and protective clothing where there is risk of skin contact, and eye protection if there is risk of splash from liquid flux.

Personal Protective Equipment and Clothing

Your employer is required to provide personal protective equipment and clothing (PPE) when hazards in the workplace cannot be eliminated or to increase protection. Your employer must make sure it complies with the relevant Australian Standard.

You should be instructed and trained in the correct use and storage of the PPE provided by your employer and you must use it and follow all safety instructions. Some of the items of PPE you may use in the electrical and electronics industry are given below.

Safety helmets should be non-conductive. They provide protection from overhead wires, structures and falling objects.

Clothing provides protection from electric arcing/flask burns, flying objects and electric shock.

Ideally, clothing should cover the body completely and:

- be of cotton material;
- have non-conductive and concealed buttons;
- have sleeves to wrist length; and
- have legs which reach to the footwear.

Safety glasses provide protection from electrical arcing and flying objects.

Insulating gloves provide protection from electric shock. They should be worn when accidental contact with live conductors is possible, but they must never be the sole means of insulation.

Personal Protective Equipment and Clothing

When using gloves, note:

- rated gloves are designed for live work and are rated according to the level of voltage they are able to insulate against.
- rated gloves should be tested regularly to determine their effectiveness.
- non-rated gloves are for mechanical protection only.
- all gloves should be inspected before each use.

Safety footwear should be non-conductive. It provides protection from electric shock and falling objects.

Insulating mats should be used when working on live conductors or where accidental contact is possible. They must never be the only means of insulation.

Now try the self-assessment questions on the Internet at www.docep.wa.gov.au

BEFORE you start the questions, it is important to type your name on the computer screen exactly as you want it to appear on your certificate.

There are 16 questions and if you get 12 or more correct you can print online a WorkSafe Smart Move Certificate signed by the Minister for Consumer and Employment Protection.