Safe working and supervision guide for electrical apprentices

ESO
Electrical Safety Office
WorkSafe.qld.gov.au

Queensland Government

Preface

Message from the Commissioner for Electrical Safety

Congratulations on becoming an electrical apprentice and taking the first steps in your career in the electrical industry.

The electrical industry offers a diverse range of employment. However, it is extremely important that you ensure you are free from electrical risks and safe during your apprenticeship.

The electrical industry consists of work in various sectors including housing, commercial, industrial, petrochemical, electricity supply and transmission and distribution sectors, rail traction, motor winding, switchboard building, appliances and whitegoods, manufacturing, renewable technology industry including batteries and wind generation and solar.

Depending on the type of electrical apprenticeship you undertake, there is a fair bit to know about the electrical trades. You will need to maintain and remain competent in your trade throughout your working life. Skills maintenance and continuing professional development, such as developing skills for new and emerging technologies, are becoming an essential part of an electrician's career development.

The Electrical Safety Board supported the development of this Safe working and supervision guide for electrical apprentices. The aim is to assist with ensuring the electrical safety of electrical apprentices in Queensland. The guide's purpose is to assist in ensuring that you understand the electrically safe working practices required of you as an apprentice. It is also key that your supervising licensed electrical worker is involved in ensuring your safety. Their understanding and application of these electrically safe working practices are also essential. Included in their responsibility is the requirements for apprentice supervision, mentoring and electrical safety.

Apprentices, please take the time to read all of this guide. Also keep it as a reference. Save it either as a PDF on your phone or print it out and keep it with you in your toolbox. Some of the content in this guide may have already been covered by your employer and/or registered training organisation. However, please take the time to read this guide so that you understand what is required of you as an apprentice. Please ensure that you continually ask questions so that you understand the task required to be performed and keep safe.

Supervising tradesperson, it is a privilege to supervise an apprentice. Whether it be a first or a fourth year apprentice, your guidance and mentoring will shape their skills as well as the safety culture and safe work behaviours that you instil in them. Please ensure that you always understand the capabilities and competencies of your apprentice. When it comes to ensuring the safety of an apprentice, make sure they are working safely, included in the risk assessments and lockout/tag out procedures and are aware of the importance of testing correctly.

As an apprentice, I wish you all the best on your journey through your apprenticeship.

Stay safe and be proud.

Keith McKenzie,
Commissioner for Electrical Safety, Queensland

Purpose

This guide covers the basic electrical safety practices that every electrical apprentice should follow. It is written for apprentices, their employer and their supervisor. The aim is to assist apprentices in ensuring they have sufficient basic knowledge of electrical safety and safe work practices prior to commencing the apprenticeship and throughout their trade training.

Every apprentice must be aware of the risks involved in working with electricity when entering or working in the electrical industry.

- The danger is real.
- All electric shocks must be avoided.
- All electric shocks are potentially fatal. Arc flash burns are also potentially dangerous or fatal.
- Minor shocks could have resulted in death or injury if circumstances were slightly different. Arc flash burns can be severe and leave permanent damage which could prevent you from returning to work as an electrician.
- Your first shock could be your last.
- Make electrical safety at work your priority.

Safe working practices and procedures are an integral and essential part of working in the electrical trade. They must be the first skills learned. A person is safer when the appropriate safe work practices and procedures are followed when carrying out electrical work.

This resource is based on the following Queensland legislation and codes of practice:

- Work Health and Safety Act: https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2011-018
- Work Health and Safety Regulation: https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2011-0240
- Electrical Safety Act: https://www.legislation.qld.gov.au/view/pdf/2017-10-23/act-2002-042
- Electrical Safety Regulation: https://www.legislation.qld.gov.au/view/pdf/2022-06-17/sl-2013-0213
- Managing electrical risks in the workplace Code of Practice 2021: https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0025/72637/managing-electrical-risks-in-the-workplace-cop-2021.pdf

Supporting documents and other resources are also available on the Electrical Safety Office website:

- www.eso.qld.au
- https://www.electricalsafety.qld.gov.au

Specific information and resources for electrical apprentices and trainees are also available at:

- https://www.worksafe.qld.gov.au/licensing-and-registrations/electrical-training/apprentices-and-trainees

Note: This document may be amended from time to time to take account of changes in line with legislation, regulation, standards and/or industry stakeholder reviews.

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Part 1: Recommended safe work practices for apprentices

Overview of safe working practices for electrical apprentices

Electrical isolation and safe working procedures are an essential part of every electrical worker's job and, if practiced correctly, can assist in preventing injury or save a life.

As an apprentice, you must be supervised throughout your apprenticeship. This is a legal requirement for every stage of your apprenticeship.

Only a licensed electrical worker can supervise an electrical apprentice. Your supervisor is required to explain to you the correct safe work procedures to be followed. You need to clearly understand these before you start work and to follow these instructions.

Before starting work:

- Be job ready – come to the job focused on the task you are to do.
- Plan and discuss the job with your supervisor – discuss and assess any safety risks with them and the risk management. You should participate in the pre-start risk assessment steps.
- Always identify the means of safe electrical isolation – the best option is to isolate at the main supply point (upstream of the work area). Do not work on or near energised electrical parts or equipment.
- Make sure you receive clear instructions about the work (written if necessary) from your supervisor. Confirm with your supervisor that you understand them. If unsure always ask questions.
- Check that your work mates know and are competent in rescue and resuscitation techniques and low voltage rescue. If you are required to act as a safety observer, you must be trained in these skills and retrained annually.
- Check that a low voltage rescue kit is available on site and well maintained.
- Make sure that you have the correct personal protective equipment (PPE) for the task and that it is in good condition. Your employer should provide you with the appropriate PPE and train you in its correct use. PPE should not be your only risk control measure as it provides only limited protection from electrical risks such as electrical shock, arc flash and arc blast.
- Check that you have the correct tools for the job, and they are in good condition. Tools for electrical work should be insulated.
- Check that any plug-in tools or equipment you use on the job are protected by a Residual Current Device (RCD, also called a safety switch). You should use a portable RCD pack on the job and regularly check it is working correctly by tripping its inbuilt test button.
- Take care and think about what is to be done. Again, if unsure ask questions.
- Check that there is electrical protection for the circuit or equipment, such as an RCD, at the point of supply. Check if the upstream electrical protection has a maintenance setting that enables an immediate circuit trip if any fault occurs.
- Do not work on energised electrical equipment. Isolate the electrical equipment or circuit by removing the fuses and/or switching off the circuit breaker. It is safer to isolate by turning off the power supply at the main switchboard (upstream of the equipment). If the owner of the property does not want the power turned off, contact you employer.
- Your safety at work is essential. An electrician should always secure the isolation by fitting personal locks and "Danger" or "Out of service" tags (as applicable) at the point(s) of isolation. This ensure that any equipment cannot be re-energised while it is being maintained. All workers involved in the work, including an apprentice, should attach their tags/ lockout along with the electrician who isolates the equipment/circuit.
- Erect safety barriers where required.
- There are still dangerous electrical risks associated with working near energised electrical equipment. You should cover adjacent energised apparatus with insulating barriers.
- **Test for dead before you touch** – always test for no voltage before starting work and always check that your test instruments are working correctly before and after every test.
- Don't trust someone else to isolate the power for you. Check yourself before you touch and do any work.
- If you leave the work, re-check for voltage on your return. Someone might have turned the power back on while you were away.
- Ensure test instruments are the right type for the electrical work. They must have the correct protection rating for the voltage and fault current potential rating at that point in the installation (e.g. Category IV and suitable insulated probes).
- Use the correct earthing equipment.
- Start work only when you are instructed to do so and only if it is safe to do so.

- If you are within the first six months of your apprenticeship, **you must not be working on or near energised electrical parts**.

Remember: If in doubt, ask your supervising electrical worker for advice and instructions before starting the task.

When working:

- Always follow the safe work method procedures provided by your employer.
- Always wear your PPE and wear it correctly.
- Always use the correct tools and safety equipment required for the work.
- Use a safety observer if the risk assessment requires one for controlling the electrical risk.
- Never put yourself or others at risk.
- Never rely on your memory about work conditions. If unsure about anything, check visually or re-test to ensure the equipment is not energised.
- Disconnect conductors in this order – the active first, the neutral second and the earth last.
- Connect/re-connect conductors in this order – the earth first, then the neutral and the active last.
- Always check the isolation points and re-test before resuming work after a break – test dead before you touch.

On completion of work:

- Check that your tools are not left on or in the job.
- Remove any personal earthing equipment (where applicable).
- Notify all personnel that the equipment will be energised/re-energised.
- Remove your "Danger" or "Out of service" tags and locks.
- Once re-energised, test the equipment to ensure:
  - it is the correct polarity
  - it is electrically safe
  - to confirm that the equipment is operating correctly, including restoration of normal electrical protection settings (if applicable).
- Remove and store all safety barriers and other equipment.
- Relinquish your access or vicinity work permit (if relevant).

Safety practices:

- Keep a well maintained first aid kit handy.
- Know the electric shock rescue and resuscitation procedure.
- Know where the Low Voltage Rescue Kit is and ensure it is maintained.
- Know where fire extinguishers are located at each work site and how to operate them.
- Know the correct type of fire extinguisher to use for the various types of fires.
- Keep your workplace clean and tidy.
- Report all electrical accidents and shocks to your supervisor and employer immediately (who must report them to the Electrical Safety Office).
- Wear appropriate safety clothing for the type of work to be performed – for general electrical work wear a long sleeve fire-retardant cotton shirt and long pants, no metal jewellery or metal parts in clothing or belts (including no underwire bras) when performing electrical work.

Tools – in general:

- Use the correct tools for the job at hand.
- Regularly check, clean and maintain all tools.
- Use RCDs when using plug-in electric tools.
- Use insulated ladders.
- Use approved safety harnesses and other equipment.
- Use non-conducting tape measures when working on or near electrical equipment.

Table 1: Recommended types of tools required for electrical work in general.

Essential tools – safe work practices	Additional tools – dependant on type of work
• 1000V insulated linesman pliers with crimp handle • 1000V insulated long-nose pliers • 1000V insulated side-cutters • 1000V rated screwdriver set containing assorted sizes of both flat head and Phillips head drivers • Insulated multi-grips • Voltage tester – minimum level of protection Cat IV with insulated probes • Multi-meter/clamp-meter – minimum level of protection Cat IV with insulated probes • Proximity tester • Personal lockout kit • AS/NZS 3000 – "Wiring Rules" • Toolbox/bag with lock • Tool pouch	• Vice grips • Wire crimpers • Hacksaw • Junior hacksaw • Hammer • Magnetic level – 300mm • 8m tape measure (metric only) • Plasterboard saw • Flat bastard file • Round file • Gas torch • Tin snips • Conduit cutters • 3 Adjustable shifter – assorted sizes • Metric spanner set • Metric socket set • Metric Allen key set • Cold chisel • Cable stripper/knife • Parrot beak cutters/ratchet cutters • String line and plumb bob • Chalk line • Centre punch • Battery drill

Type of test instrument for "test for dead"

- Use a voltage indicator that suits the type of work activity (e.g. voltmeter). Use insulated probes. You should also use a test instrument that incorporates a visual display to confirm if a circuit is energised and the voltage level of the equipment/circuit before commencing work.

  The electrical potential (such as voltage level and fault current potential at that point of the installation) will determine the Installation Category for the instrument that you must use for testing (e.g. Cat IV for testing at a low voltage (LV) circuits and switchboards).

Proximity voltage testers are not reliable in proving if equipment and/or circuits are de-energised. They should only be treated as an indicator.

- Proximity voltage testers should be tested for correct operation immediately before use and again immediately after use. In particular, if the test result indicates zero voltage, then confirm that the instrument is still working correctly.

Electrical safety regulation requirements for electrical work

Electrical Safety Regulation 2013

Section 22 — How work is to be carried out.

(1) A person conducting a business or undertaking must ensure that electrical work on or near energised electrical equipment is carried out:

- **a) by a competent person who has tools, testing equipment and personal protective equipment that:**
  - **I. are suitable for the work**
  - **II. have been properly tested**
  - **III. are maintained in good working order**
- **b) in accordance with a safe work method statement prepared for the work; and**
- **c) subject to subsection (4), with a safety observer.**

Figure 1: Completing electrical work safely.

Part 2: Health and safety responsibility at work

Work health and safety responsibilities

Employer and employee responsibilities for maintaining workplace health and safety are set out in Sections 19 and 28 of the Work Health and Safety Act 2011 (Queensland).

Employers have a duty of care to maintain a safe working environment for employees by providing:

- information and training
- safe work procedures
- safety equipment
- effective supervision.

Employees have a duty of care to:

- ensure their own safety
- avoid any act or omission which adversely affects the safety of others, during the performance of their work.

Employees must:

- co-operate with their employer
- follow safe work procedures
- use protective equipment.

Mental health wellbeing and safety at work

The mental wellbeing of workers at work is good for everyone. It enhances personal and business resilience and success.

Everyone has a role to play. This includes looking after your own mental health and assisting in creating a mentally healthy workplace.

Mentally healthy working environments generally have a few things in common.

- **Positive workplace culture**. Put simply, they›re places where people feel good about coming to work and everyone›s encouraged and supported.
- **Stress and other risks to mental health are managed**. Stress, heavy workloads, unrealistic deadlines, poor communication, uncertainty – these and other factors can all contribute to anxiety and depression. It's up to employers, managers and supervisors to keep them in check.
- **People with mental health conditions are supported**. Helping employees to stay at or return to work has clear benefits. This is for both for the individual and the business.
- **Zero-tolerance approach to discrimination, as well as bullying and sexual harassment**. Protecting employees from discrimination, bullying and sexual harassment encourages a diverse workforce and ensures everyone gets a fair go. This is a legal requirement as well.

Tips for young workers and apprentices

As a young worker and/or apprentice, think about why your health and safety is important. It is crucial, not just for your job but for enjoying your life outside of work as well.

Statistics show that you are more likely to be injured in the first few months of a new job than if you have been doing it for a while.

It is key to actively participate in the way that work health and safety is managed in your workplace. This includes:

- taking induction and training seriously
- using the risk management process for your work tasks
- following the safe work procedures of your employer
- asking for help before you start a task that you're not familiar or comfortable with.

Some ways you could ask your immediate supervisor for help are:

- "I'm not sure how this works, could you spare a few minutes to show me again?"
- "I think I've got the hang of this, but can you watch to make sure I'm doing everything right?"
- "I'm still a bit uncomfortable with this, would you mind explaining it/showing me again?"

Tips for employers

Employers must ensure the work environment and the way workers carry out their work is safe and healthy, regardless of the type and terms of their employment. This includes protecting young workers and apprentices from both physical and psychological workplace hazards.

Employers of young workers should:

- understand young workers' risk profiles
- ensure a safe and healthy workplace
- provide information, training, instruction and supervision
- develop a positive workplace culture.

Bullying in the workplace

Everyone has the right to a workplace free from bullying.

Bullying happens at work when:

- a person or group of people repeatedly behave unreasonably towards another worker or group of workers
- the behaviour creates a risk to health and safety.

Examples of bullying include:

- behaving aggressively towards others
- teasing or playing practical jokes
- pressuring someone to behave inappropriately
- excluding someone from work-related events
- unreasonable work demands.

With the widespread use of social media, cyber bullying should also be considered a metal health risk in the workplace and addressed if occurring as a result of the workplace.

Sexual harassment in the workplace

Under the Fair Work Act, sexual harassment at work happens when a worker or group of workers:

- makes an unwelcome sexual advance
- makes an unwelcome request for sexual favours
- engages in other unwelcome conduct of a sexual nature in relation to another worker.

For behaviour to be considered as sexual harassment, it has to be reasonable to expect that there is a possibility that the worker being sexually harassed would be offended, humiliated or intimidated.

Some forms of sexual harassment can also be considered bullying if the behaviour is repeated or continuous. But unlike bullying, sexual harassment does not need to be continuous or repeated behaviour, it can be a one-off event.

There is also no need to establish a risk to health and safety. You can find out more at: https://www.fairwork.gov.au/bullying-sexual-harassment-and-discrimination-at-work

Discrimination in the workplace

Bullying is different from discrimination. The Fair Work Act prohibits an employer from taking adverse action against an employee for discriminatory reasons, including their sex, race, religion or gender. Adverse action can include firing or demoting someone.

Bullying doesn't have to be related to a person's or group's characteristics. Adverse action doesn't have to have happened for bullying to occur.

Resources for help with mental health concerns include:

- Headspace for young people: https://headspace.org.au/
- If you are in an emergency situation or need immediate assistance, contact mental health services or emergency services on 000.
- Lifeline: https://www.lifeline.org.au/ or if you are in an emergency situation or need immediate assistance, contact Lifeline on 13 11 14.
- MATES in Construction – MATES in Energy: https://mates.org.au/. If you need help phone them on 1300 642 111.

MATES provides suicide prevention through community development programs on sites and by supporting workers in need through case management and a 24/7 help line.

MATES was established in response to a major report on suicide (the 'AISRAP Report') within the Queensland commercial building and construction industry. This report found that suicide rates in the industry were higher than the Australian average for men. It also found that youth suicide within the industry could be as much as 2.38 times more common than among other young Australian men.

The MATES program is based on the simple idea that suicide is everyone's business. If the building and construction industry in Australia is to improve the mental health and well-being of workers and reduce suicide, then it cannot be left to mental health professionals: everyone in the industry must play their part.

Working for the construction industry in general, MATES is independent of employers and unions and never works directly for an employer. Programs are delivered across the industry regardless of employer or union affiliation.

Other resources:

- https://www.worksafe.qld.gov.au/safety-and-prevention/hazards/workplace-hazards/young-workers
- https://www.headsup.org.au/healthy-workplaces/what-is-a-mentally-workplace

Are you a female electrical apprentice?

There are resources and mentoring programs which provide support and guidance for you throughout your apprenticeship and trade career. This is a great career for women and your apprenticeship is the pathway to many career opportunities in the electrical industry.

Support and mentoring services include:

- National Association of Women in Construction: https://nawic.com.au/NAWIC/Chapters/QLD/Mentoring.aspx
- Busy Sisters: https://busysisters.com.au/

Access to toilets for female apprentices

Access to clean toilets must be provided for all workers while they are at work. Where reasonably practicable, toilet facilities should be provided for workers, rather than relying on access to external public toilets.

Separate toilets should be provided in workplaces where there are both male and female workers.

However, one unisex toilet may be provided in workplaces with both male and female workers where:

- the total number of people who normally work at the workplace is 10 or fewer
- there are two or fewer workers of one gender. For example, a workplace with two male and eight female workers or with one female and three male workers could have a unisex toilet because there are 10 or fewer workers in total and two or fewer workers of one gender.

A unisex toilet should include one closet pan, one washbasin and means for disposing of sanitary items.

Mobile, temporary or remote workplaces

If work is undertaken away from base locations or at outdoor sites, workers must have access to other toilets (e.g. public toilets or toilets at clients' premises). In such cases, information should be provided to workers on where the toilets are located.

Where it is not reasonably practicable to provide access to permanent toilets, portable toilets should be provided. For example, short-term temporary workplaces and workplaces in remote areas could apply.

Portable toilets should be located in a secure place with safe access. They should be installed so they do not fall over or become unstable. They should be serviced regularly to keep them clean.

Further information on health and safety facility requirements is available in:

- Managing the work environment and facilities Code of Practice 2021 (Queensland) https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0021/72642/managing-the-work-environment-facilities-cop-2021.pdf

Additional health and safety resources for apprentices:

- Young worker safety toolkit: https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0014/17105/young-workers-toolkit.pdf
- Workplace mental health matters film:

https://www.worksafe.qld.gov.au/safety-and-prevention/mental-health/mentally-healthy-workplaces-toolkit

Electrical safety responsibilities

Your employer must ensure their business is conducted in a way that is electrically safe and, if the business includes the performance of electrical work, ensure the electrical safety of all persons and property – Electrical Safety Act 2002 (ES Act) section 30.

Essentially, this means that your employer must ensure that:

a) the way the electrical work is performed is electrically safe

b) the work, when complete, is electrically safe.

This includes ensuring the work is inspected and testing by a competent person to confirm it is electrically safe.

A worker, while at work, must:

- take reasonable care for their own electrical safety
- comply with any reasonable electrical safety instructions provided by the employer – ES Act section 39.

Electrical work on or near energised electrical equipment is prohibited – Electrical Safety Regulation (ES Regulation) section 14

Your employer must ensure that electrical work is not carried out on or near electrical equipment while the equipment is energised.

Also, your employer must ensure that:

- before electrical work is carried out on electrical equipment the equipment is tested by a competent person to decide whether it is energised – ES Regulation section 15.

There are only very limited circumstances where there is an exemption to this restriction. Testing is one of these exemptions. However, testing is "live" electrical work and a risk assessment must be undertaken to determine the control measures for managing the risks.

For your safety, do not work "live". Turn the power off. Isolate upstream at the point of power supply wherever possible.

If in doubt on a job site, check with your employer. The owner of the property and/or equipment cannot authorise the electrical worker to undertake "live" electrical work or insist that the power is not turned off. Your employer is responsible for ensuring the work can be undertaken safety.

Electrical licensing

It is illegal to perform or supervise electrical work in Queensland without holding an electrical work licence for the class of work to be performed – ES Act section 55.

An electrical worker must hold an electrical worker licence for the type of work they perform (e.g. an electrical mechanic licence).

The employer of an electrical apprentice (undertaking electrical mechanic training) must hold an electrical contractor licence if the employer contracts to the public for electrical installation work. Anyone who contracts to the public to perform electrical work and installation work, including a sub-contractor, must hold an electrical contractor licence.

An electrical apprentice can perform electrical work without holding a licence or permit:

- for training purposes only
- only under supervision of a licensed electrical worker
- only while under an apprenticeship contract.

You should not perform any electrical work outside of the work under your contract of employment for the apprenticeship.

You must obtain an electrical worker licence at the completion of your apprenticeship before you can carry out electrical work lawfully as an electrical tradesperson.

Applications for an electrical worker licence must be made to Workplace Health and Safety Queensland.

The type of electrical licence is dependent on the:

- employers' scope of work
- qualification and units of competency completed in the off job training
- amount of electrical work experience gained on-the-job in the apprenticeship.

Licence application details for a completing apprentice are available at: https://www.worksafe.qld.gov.au/licensing-and-registrations/electrical-licences/electrical-worker-licences/completing-apprentices

Employer responsibilities for apprentice training

Employers must provide suitable training and supervision for an apprentice. This is to ensure they develop and maintain the necessary electrically safe work practices, as well as the electrical work standards and experience required throughout their apprenticeship.

The employer must provide the apprentice with tasks and training which align to the apprenticeship training plan. It is the employer's responsibility to provide, or arrange to provide, the range of work, supervision and facilities required under the training plan.

Type of work limitations for apprentices

There are limits on the type of electrical work suitable for apprentices. These limits ensure that new, less experienced and younger workers are not placed at risk of electrical shock, injury or death.

The employer must ensure that an apprentice, within the first six months of their apprenticeship, does not work in the immediate vicinity of energised high voltage exposed parts or anywhere there is a risk they could come into contact with low voltage exposed parts – ES Regulation section 279.

The employer must ensure that an apprentice is supervised by an electrical worker **at all times** throughout the apprenticeship. The supervisor must be competent in the role and hold a current electrical licence for the type of work performed.

The level of supervision required must be appropriate having regard to the:

- type of electrical work performed
- adequacy of the apprentice's training
- competency of the apprentice.

Apprentice record of on-job training

The employer and the apprentice must maintain an individual record of each apprentice's experience, progress and performance throughout the apprenticeship. The system of on-job work experience recording used in Queensland is the profiling system.

An apprentice in the electrical industry must demonstrate they are gaining the required range and depth of experience in electrical work required for an electrical license as they progress through their apprenticeship.

The apprentice must submit their profiling records on a regular basis and the employer must ensure the record is validated in a timely manner.

The supervisory registered training organisation (SRTO) must monitor the apprentice's profiling record throughout the apprenticeship and flag any potential issues with the employer and/or apprentice.

Apprentices' responsibilities during training

The employer must provide the apprentice with tasks and training which align to the apprenticeship training plan.

The apprentice is responsible to know these requirements and work towards achieving the competencies identified in the training plan.

The apprentice must work with the employer and supervising electrical worker to achieve a high standard of safety and workmanship. This includes following instructions and safe working procedures provided by the supervisor and employer.

As an apprentice, you must not start a task for which you feel unprepared, or the task may appear to be risky. If ever in doubt about anything, consult your supervising electrical worker and/or employer.

Electrical work standards

Supervising electrical workers are responsible for:

- ensuring that the apprentice learns the necessary work skills
- checking and testing all electrical work carried out by the apprentice.

They must ensure the electrical work performed by the apprentice complies with the ES Act. This also includes that the work complies with the AS/NZS 3000 Electrical installations "Wiring Rules" and other relevant technical standards.

Additional electrical safety resources for apprentices:

- eSafe newsletter with news and practical information for apprentices in the electrical industry. Subscribe at: https://www.worksafe.qld.gov.au/news-and-events/newsletters/esafe-newsletters/esafe-editions/esafe-electrical-apprentice
- Electrical safety for apprentices https://www.worksafe.qld.gov.au/licensing-and-registrations/electrical-training/apprentices-and-trainees
- Electrical safety for apprentices film https://www.worksafe.qld.gov.au/resources/videos/films/electrical-safety-for-apprentices

Part 3: Electrical risk and risk management

Dangers of working with electricity

Electrical risks

Electrical risks are risks of death, shock or other injury caused directly or indirectly by electricity.

The most common electrical risks and causes of injury are:

- **Electric shock** causing injury or death. The electric shock may be received by
  - direct or indirect contact with energised parts
  - tracking of electrical current through or across a medium
  - electrical current arcing.

  For example, electric shock may result from indirect contact where a conductive part, which is not normally energised, becomes energised due to a fault.

  This may happen when a metal switchboard surrounds, or a water pipe becomes energised due to a reverse polarity connection (active and neutral conductors are reversed when connected) causing the earthing system and any earthed metal part to be energised.
- **Fire, arcing or explosion causing burns** – such as fire resulting from an electrical fault.

These injuries are often suffered because arcing or explosion or both occur when high fault currents are present due to a short circuit. For example, a short circuit fault in a switchboard.

- **Electric shock from "step-and-touch" potential**.
- **Toxic gases** causing illness or death. Burning and arcing associated with electrical equipment may release various gases and contaminants.

Even the briefest contact with electricity at 50 volts for alternating current (V AC) or 120 volts for direct current (V DC) can have serious consequences for a person's health and safety.

High voltage shocks (involving more than 1000 V AC or 1500 V DC) can cause contact burns and damage to internal organs.

Electric shock may also lead to other injuries, including:

- falls from ladders, scaffolds or other elevated work platforms
- muscle spasms, palpitations, nausea, vomiting, collapse and unconsciousness.

A worker using electricity may not be the only one at risk – faulty electrical equipment and poorly maintained electrical installations can lead to fires that may also cause death or injury to others.

A slip with a screwdriver or a dropped tool when working in a switchboard, although appearing to be a very small failure of a work practice, can result in such a serious accident.

All electric shocks must be avoided.

All electric shocks are potentially fatal.

Minor shocks could have resulted in death or injury had circumstances been only slightly different.

Your first shock could be your last.

You must report any electric shock to your supervisor.

Electric shock

The human body is a conductor of electricity. A current will flow through body tissue when contact is made simultaneously with two energised objects which are at different voltage potentials.

For example, if two terminals of different potential are grasped, one in each hand, current will flow through the body from hand to hand. A similar effect will be produced if only the active is touched and the person is in contact with earth or a conducting material in contact with earth (such as a metal step ladder).

Contact may also be made by tracking through or across a medium (e.g. wet area) or by arcing.

Electric shock is the effect produced on the body, particularly the nervous system, by an electric current. The effect of a shock depends on the:

- magnitude of the current
- path of the current
- frequency of the voltage
- duration of contact.

Even the briefest contact with electricity can have serious consequence.

The normal rhythm of the heart can be interrupted if the amount of current flow is within a certain range and it passes through or across the heart region. In this state, known as ventricular fibrillation, the heart contracts and cannot maintain blood circulation.

Return to normal rhythm rarely occurs spontaneously and if the condition persists for more than a few minutes, the result is almost certain to be fatal.

Electric shock may also stop the heart completely and/or stop the victim's breathing.

Table 2: Effects of electric shock on the body.

Current	Effect	Levels of protection
1mA	Barely perceptible	These measurements of current flow are low and may be barely perceptible.[1]
1 – 3 mA	Perception threshold (most cases)	
3 – 9 mA	Painful sensation	
9 – 25 mA	Muscular contraction (cannot let go)	These measurements of current flow are potentially dangerous. A RCD is designed to trip before a current of 30mA is reached. AS/NZS3000 (Wiring Rules) – RCD protection is required to provide additional protection on an electrical circuit. [2]
25 – 60 mA	Respiratory paralysis (may be fatal)	
60mA or more	Ventricular fibrillation (probably fatal)	
4 A or more	Heart paralysis (probably fatal)	
5 A or more	Tissue burning (fatal if vital organ)	
10 A or more	Cardiac arrest, severe burns. Death is probable	

Electricity supply systems typically operate at a low voltage (LV) level of 230 V AC phase to earth and 400 V AC phase to phase.

A shock at these voltage levels can be fatal. It is essential that adequate precautions and control measures are taken to ensure no one comes into contact with any energised electrical equipment or circuits.

A high voltage (HV) shock (of 1,000 V AC or more) may inflict other forms of serious injury such as severe burns and organ failure.

Under normal circumstances, extra-low voltages (ELV) below 50 V AC generally are not harmful to humans. However, they must still be treated with respect, especially in wet or polluted areas. Children and the elderly may also be more vulnerable to electrical risk at these extra low voltage levels.

Do not work on energised equipment.

Always test for "dead" before you touch.

Follow your employers safe work method statement (SWMS).

1 In normal circuit operation, a person should not be able to contact an energised electrical part of equipment or an installation. However, in a fault situation, where a person may come in contact with energised electrical parts, these levels of current or greater may flow.

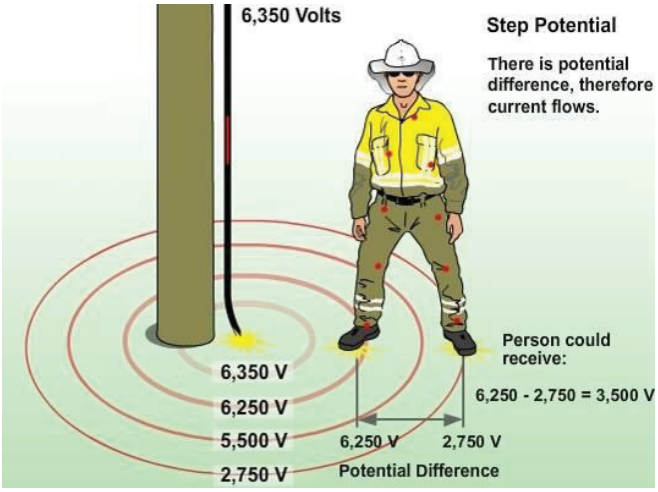
2 AS/NZS3000:2018 Section 2.6 Additional protection by Residual Current Devices. 2.6.1 General – The use of fixed setting RCDs with a rated operating residual current not exceeding 30 mA is recognized as providing additional protection in areas where excessive earth leakage current in the event of failure of other measures of protection or carelessness by users could present a significant risk of electric shock. NOTE: The use of RCDs is intended only to augment other measures of basic protection.

Electric shock from "step-and-touch" potential

Step and touch voltage hazards

Step voltage: The prospective or open circuit voltage that may appear between any two points (1 metre apart) on the surface of the ground.

Touch voltag: The prospective or open circuit voltage that may appear between any point of contact with conductive parts (that are located within 2.4 metre of the ground) and any point on the surface of the ground with a horizontal distance of one metre from the vertical projection of the point of contact with the conductive part.



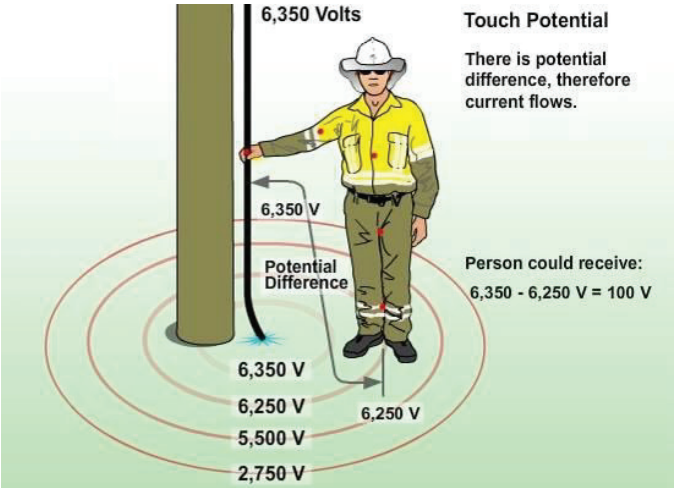


Figure 2: Step and touch potentials.

Step and touch potentials are very relevant in fault conditions where leakage may occur from the supply network down to the ground. For example, a fault condition where a reverse polarity occurs on the network or there are fallen power lines.

Anyone standing between the different voltage gradients may experience an electrical shock. The amount of potential shock current is dependent on the difference of potential between the two points of contact.

Burns

Electrical arcing occurs when electrical insulation between conductors can no longer withstand the applied voltage or there is a fault such as a bridge between conductive material.

Electricity flashovers/arcs can produce extreme temperatures, very high forces, and toxic gases. A person in the vicinity of a flashover/arc can commonly suffers burns, permanent disfigurement or fatal injuries.

The risk of injury to a worker from an explosion is extreme when high fault currents are present. This typically applies to low voltage circuits close to transformers or switchboard. In these situations, the electrical protection may only detect and interrupt an arcing fault slowly or may not interrupt at all.

An arc flash is a serious hazard that has the potential to cause death, serious injury, damage to equipment and loss of electricity supply. An arc flash is an unexpected and violent electrical short circuit in the air that produces an arc and associated explosion of gases and molten metal – AS/NZS4836.

It is important to understand that an arc flash incident can occur in LV and ELV installations due to high fault current potentials. There is the potential of short circuit fault current up to 25 times the rated current of the transformer.

Arcing faults can occur at any time and for a variety of reasons. Most arc flash incidents occur when workers are performing high risk activities. For example, activities such as operating or racking circuit breakers or tools, or when equipment comes into contact with energised parts in the vicinity of the work.

This typically may involve the action or poor work practice of a worker. For example, due to unsafe work practices during maintenance or energisation of equipment when working within a switchboard.

An electrical apprentice should not work on energised electrical equipment.

Do not let someone pressure you into performing work on energised electrical equipment.

It is your employer's responsibility to ensure work is not performed on energised electrical equipment.

WARNING

The following page contains photos of a person who received severe burns to his body from an arc flash. These photos may be disturbing for some.

Mark's story – Don't work "live"

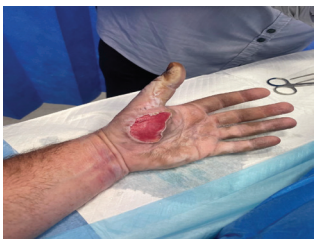


Figure 3: Mark's severe injuries from an arc flash burn.

Watch Mark's arc flash story:

https://www.worksafe.qld.gov.au/resources/videos/films/arc-flash-safety-marks-story

Watch an arc flash video:

https://www.worksafe.qld.gov.au/resources/videos/films/electrical-arc-flash-film

De-energisation is best ensured by electrically isolating the equipment/conductors upstream from the switchboard at the power supply before the work is to be performed.

Falls

Falls from ladders, scaffolds or other elevated work platforms can occur as a direct consequence of an electric shock or arc blast, potentially resulting in serious injury or death.

Poisoning gases

Burning and arcing associated with electrical equipment failure may release various harmful gases and contaminants. Inhalation of these dangerous products may cause short term or chronic illness or result in death from suffocation.

Fire

Electrical workers may not be the only ones at risk. Faulty electrical equipment and poor standards of work can lead to fires that may cause injury or death to persons using the installation and cause property loss.

Managing electrical risk in the workplace

Risk management steps:

1. Identify the hazards
2. Assess the risk
3. Control the risk
4. Review the control measures

Identify the hazards

You have a duty to identify the hazards involved in any work you may undertake – Work Health and Safety (WHS) Regulation section 34.

The first step in the risk management process is to identify all hazards involved with electrical work. This involves finding things and situations that could potentially cause harm to people.

Hazards generally arise from the following aspects of work and their interaction:

- physical work environment
- equipment, materials and substances used
- work tasks and how they are performed
- work design and management.

Hazards can be identified by looking at the workplace and how work is carried out.

Hazards associated with electrical equipment or an electrical installation may arise from:

- the design, construction, installation, maintenance and testing of electrical equipment or electrical installations.
- design change or modification
- inadequate or inactive electrical protection
- where and how electrical equipment is used. For example, equipment may be at greater risk of damage if used outdoors or in a factory or workshop environment.
- electrical equipment being used in an area in which the atmosphere presents a risk to health and safety from fire or explosion (e.g. confined spaces)
- the type of electrical equipment. For example, 'plug in' electrical equipment that is moved around from site to site, including extension leads, is particularly liable to damage.
- the age of electrical equipment and electrical installations
- work carried out on or near electrical equipment or electrical installations, including electric overhead lines or underground electric services. For example, where work carried out in a confined space is connected to plant or services.

Assess the risks

Assessing the risk involved with electrical work is the second step. Risk assessment involves considering what could happen if someone is exposed to a hazard and the likelihood of it happening.

A risk assessment should be undertaken before electrical work is commenced. The ES Regulation requires that a risk assessment be prepared in writing by a competent person for work on energised electrical equipment. This includes electrical testing as testing is "live" electrical work.

An electrical apprentice should always be involved in the risk assessment for the work to be performed.

A risk assessment can help determine:

- the severity of an electrical risk
- whether existing control measures are effective
- what action you should take to control an electrical risk
- how urgently the action needs to be taken.

To assess the risk associated with electrical hazards you should consider:

- What is the potential impact of the hazard?
- How severe could the electrical hazard be? (e.g. direct contact causing electrocution, fire or explosion causing serious burns or death.)
- How many people are exposed to the hazard?
- How likely is the hazard to cause harm?
- Could it happen at any time or would it be a rare event?
- How frequently are workers exposed to the hazard?

Other factors that may affect consequence and likelihood include:

- the conditions under which the electrical equipment is used (e.g. in wet conditions, outdoors or a confined space)
- work practices and procedures (e.g. isolation, fault-finding and testing, carrying out maintenance)
- the capability, skill and experience of the workers involved.

Control the risks

Once hazards have been identified and the risks assessed, appropriate control measures must be put in place.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the "Hierarchy of risk control". You must work through this hierarchy to choose the control that most effectively eliminates or minimises the risk in the circumstances, so far as is reasonably practicable.

This may involve a single control measure or a combination of two or more different controls.

Hierarchy of risk control measures

1. **Elimination.** The most effective control measure is to remove the hazard or hazardous work practice. The hazards may be eliminated by designing-in or designing-out certain features or turning off the power supply. **Elimination should always be your first option. Turn off the power supply – don't work on or near energised equipment or circuits.**
2. **Substitution.** Replacing a hazardous process or material with one that is less hazardous will reduce the hazard and hence the risk. For example, it may be reasonably practicable to use extra-low voltage electrical equipment such as a battery-operated tool rather than a tool that is plugged into mains electricity.
3. **Isolation.** Preventing workers from coming into contact with the source of an electrical hazard will reduce the risks. This control includes separating a person from the power supply.
4. **Engineering controls.** Use engineering control measures to minimise the risk. For example, installing residual current devices (commonly referred to as safety switches) to reduce the risk of receiving a fatal electric shock.
5. **Administrative controls.** Administrative controls involve the use of safe work practices to control the risk. For example, by establishing exclusion zones, or by use of permits and warning signs.
6. **Personal protective equipment (PPE.)** PPE includes protective eyewear, insulated gloves, hard hats, protective clothing, aprons and breathing protection.

NOTE: Administrative controls and PPE do nothing to change the hazard itself. They rely on people behaving as expected and require a high level of supervision.

Exclusive reliance on administrative controls and PPE must only occur where other measures are not reasonably practicable or as an interim control while the preferred control measure is being implemented.

You should check that your chosen control measure does not introduce new hazards.

Hierarchy of risk control measures

1. **Elimination**
2. **Substitution**
3. **Isolation**
4. **Engineering controls**
5. **Administrative controls**
6. **Personal protective equipment (PPE)**

Review the control measures

The controls that are put in place to ensure electrical safety must be reviewed regularly to make sure they work effectively.

Your employer must review and, as necessary, revise a control measure in the following circumstances – WHS Regulation section 38:

- when the control measure does not control the risk it was implemented to control, so far as is reasonably practicable
- before a change at the workplace that is likely to give rise to a new or different risk to health or safety (where the existing measure may not effectively control the new risk)
- if a new relevant hazard or risk is identified
- if the results of consultation indicate that a review is necessary
- if a health and safety representative request a review.

Primary risk control measure (elimination) – working de-energised

Your employer must ensure that electrical work is not carried out on electrical equipment while the equipment is energised – ES Regulation sections 13-16.

- It is necessary in the interests of health and safety that the electrical work is carried out while the equipment is energised (e.g. it may be necessary for life-saving equipment to remain energised and operating while electrical work is carried out on the equipment).
- It is necessary that the electrical equipment to be worked on is energised in order for the work to be carried out properly.
- It is necessary for the purposes of testing to ensure the equipment is de-energised as required by ES Regulation section 15.
- There is no reasonable alternative means of carrying out the work.

If the electrical equipment cannot be de-energised during the normal operating times of a business, then the first option should be to perform the work at a time when it can be de-energised (e.g. after-hours.)

Your employer must ensure that:

- each exposed part is treated as energised until it is isolated and determined not to be energised
- each high-voltage exposed part is earthed after being de-energised.

NOTE: Testing is "Live" electrical work. Although there are some exemptions that may apply to testing, your employer must ensure a risk assessment is undertaken before testing is performed and must provide a safe system of work for conducting the type of testing to be undertaken. You must follow these safety instructions.

An electrical apprentice should not work on energised electrical equipment.

Do not let someone pressure you into performing work on energised electrical equipment.

It is your employer's responsibility to ensure work is not performed on energised electrical equipment.

Your employer must ensure that electrical equipment or circuits, which have been de-energised to allow for electrical work to be carried out, cannot be inadvertently re-energised.

The safe work principle **"Test for dead before you touch"** must be applied at all times.

Even if the electricity supply is believed to have been isolated, it must be assumed that all conductors and electrical components are energised until you have proven them de-energised.

WARNING: All electrical conductors and parts, including neutral and earthing conductors, shall be treated as energised until proven de-energised. Always test before touching – AS/NZS 4836.

Electrical isolation and de-energisation of equipment

Electrical equipment or circuits should be effectively isolated from all relevant sources of electricity supply and left in a condition where the equipment cannot be inadvertently re-energised. This will ensure electrical equipment or circuits are de-energised and remain de-energised while work is undertaken.

In all cases, the electrical worker responsible for the work must:

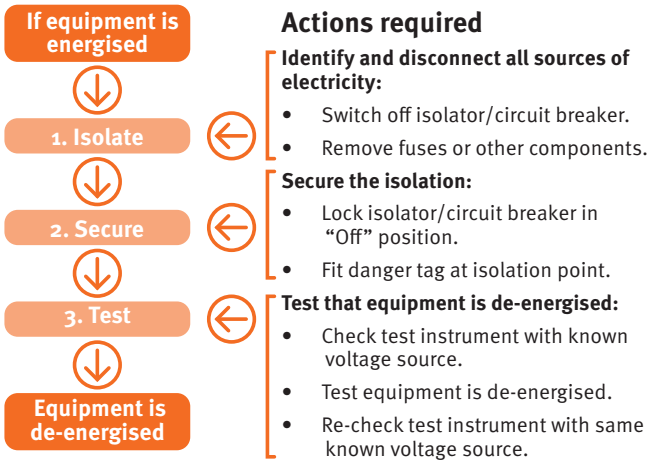
- assess the risks associated with the isolation/re-energisation of the equipment/circuits
- implement safe work procedures that control the risks to ensure the safety of all workers involved in the work.

The assessment of risk and risk control measure process must include all workers involved in the work, **including the apprentices involved in the work**.

Isolation may be done by:

- identifying the electrical equipment and conductors, all energy sources and the isolation points
- isolating the equipment or conductors by opening switches, removing fuses or links, opening circuit breakers, or by removing circuit connections
- securing the isolation by locking out
- discharging any stored energy (e.g. within capacitors)
- proving de-energisation of equipment or conductors
- identifying the limits of the safe area of work
- displaying warning notices to reduce the risk of injury or death.

Essential steps for effective de-energisation of equipment



The standard steps for isolation are:

- **Consultation** – Consult with the person with management or control of the workplace and notify any other affected persons as appropriate.
- **Isolation** – Identify the circuit(s) requiring isolation. Disconnect active conductors from the relevant source(s), noting there may be multiple sources and stand-by systems, generators or photovoltaic systems and battery back-up as well as auxiliary supplies from other boards. If a removable or rack out circuit breaker or combined fuse switch is used it should, if reasonably practicable, be racked out or removed and then locked open and danger tagged. Isolate up-stream at the main switchboard wherever possible.
- **Securing the isolation** – Lock the isolating switch(es) where practicable or remove and tie back relevant conductors to protect the person(s) carrying out the electrical work.
- **Tagging** – Tag the switching points where possible to provide general information to people at the workplace.
- **Testing** – Test to confirm the relevant circuits and any other relevant conductors in the work area have been de-energised.
- **Re-testing as necessary.**

For example, if the person carrying out the work temporarily leaves the immediate area, tests must be carried out on their return to ensure that the electrical equipment being worked on is still not energised. This is to safeguard against inadvertent reconnection by another person.

For example, to see if a wire has changed its status when cut, which can occur because it is lifted from earth.

Securing the isolation

It is essential that the point of isolation should be under the control of the person who is carrying out the work on the isolated conductors and/or equipment.

The isolation should be secured by locking off and tagging the electrical equipment.

Locks

Where a facility exists to lock a switch in the "Off" position, it must be used.

Where a facility does not exist, a portable lock out device ("lock dog") must be fitted to the switch mechanism to prevent closing.

If more than one person is working on the same de-energised electrical installation, individual workers should apply their own locks to the isolation point.

In situations where the isolation point is accessible by other persons at the work site, you should ensure that the isolation method or system is not able to be inadvertently or easily compromised.

Figure 4: Examples of locks and a group lock box.

Locks are for the safety of personnel:

- They must be uniquely keyed so that they can be fitted and removed only by the person owning the lock.
- All persons involved in carrying out the work, including apprentices, must fit their own lock at the same isolation point(s). This may require the use of a multi-lock security device.
- They must be clearly labelled to identify the owner and the nature of the electrical work being undertaken. Use a personal identification tag or Danger tag.

- They must be removed upon completion of work or at the end of the shift (if the work will be continued by others, who must fit their own locks).

Danger tags

A Danger tag on an item of equipment is a warning to all persons that the equipment must not be operated, as lives may be placed in danger.

Figure 5: Examples of Danger tags.

Danger tags are for the safety of personnel, and they must:

- be durable and securely attached in a prominent position at each isolation point
- clearly state the warning, including any warning about specific hazards relating to the isolation
- be dated and signed by the worker or workers involved in carrying out the work
- be fitted and removed only by the person/s who signed the tag
- fitted by all persons involved in carrying out the work (including apprentices) at the same isolation point(s)
- be removed upon completion of the work or at the end of the shift (if the work will be continued by others, who must fit their own Danger tags).

"Out of service" tags

This tag is used to identify appliances or equipment that are out of operation for repairs or alterations or are still in the process of being installed. While an "Out of service" tag is fitted, the appliance or equipment must not be operated.

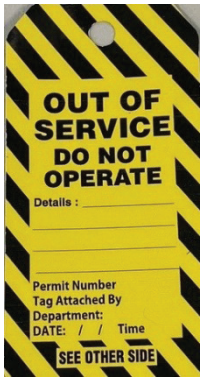


Figure 6: Example of an "Out of service" tag.

"Out of service" tags are for the safety of personnel and the security of the equipment and must:

- be durable and securely attached
- clearly state the nature of the defect or reason why the electrical equipment is unsafe
- be attached in a prominent position at the point of isolation of the appliance or equipment that is being worked on
- only be removed by a competent person after fixing or rectifying the defect and making the equipment safe or replacing it with a danger tag in preparation for work on the equipment.

De-energisation of equipment – apprentice to verify

After de-energisation of the circuit or equipment by the supervising electrical worker and prior to commencing work, an apprentice should always:

- participate in the tag and lockout procedure by applying personal tags and locks
- **"Test for dead before you touch"** – personally verify, by electrical testing, that the circuit or equipment is de-energised.

The appropriate level of supervision for an apprentice performing this task is shown in Appendix 1 – Guide for Supervision of electrical apprentices' table.

In all cases, the supervising electrical worker is responsible for the risk assessment, safe work method statement, instructions, direct supervision of the apprentice and verification and testing of the work.

Altering isolation for testing, fault finding and re-energising

It may be necessary to change an isolation point to allow for testing or fault finding on energised parts. For example, testing may be required before returning electrical equipment to service and commissioning new electrical equipment.

Any testing or fault finding on energised parts is "Live" electrical work and must be carried out safely following risk assessment and a safe system of work procedure.

If electricity supply is to be restored to part of the circuit, then safe procedures for restoring electricity supply should be followed.

Restoring power

An electrical worker should ensure that restoring electricity supply following isolation does not pose risks to health and safety of others.

For example:

- Ensure all conductors are appropriately terminated. Conductors that are not terminated into an accessory must be made safe (e.g. terminated in a junction box).
- Carry out appropriate testing on any new, altered or repaired electrical equipment (e.g. testing such as insulation resistance, earth continuity, polarity, correct connections and functionality).

- Remove safeguards, including temporary bonds and short-circuiting devices.
- Notify all workers working on the electrical equipment, and any other affected workers at the workplace, that electricity is to be restored.
- It may be necessary for workers affected at the workplace to cease work until the re-energised circuit is tested and proven safe.
- Take precautions to ensure that other electrical equipment is not inadvertently energised (e.g. ensure that only the correct circuit protective device is re-energised).
- Follow procedures for removing any locks or other control mechanisms, tags, notices and safety signs.
- Carry out a visual inspection to ensure that all tools, surplus materials and waste have been removed from the workplace.

When electricity is restored, tests should be carried out to confirm correct operation and electrical safety.

Leaving unfinished work

If work is left unfinished, an electrical worker must ensure that the worksite is left in a safe state, so far as is reasonably practicable.

For example:

- Terminate any exposed conductors (e.g. terminate in a junction box).
- Physically secure any exposed conductors or surrounding metal work.
- Tag and tape off the area of electrical equipment and the workplace. Install barriers or barrier tape to keep unauthorised persons out of the work site.
- Inform affected persons at the workplace the work is not complete and advise of potential hazards.
- Take any necessary precautions to ensure that electrical equipment cannot become inadvertently re-energised.
- Ensure the status of switchboards and electrical equipment is clearly and correctly labelled.
- Attach a "Out of service" tag as necessary.
- Hand over adequate information to workers taking up the unfinished work to allow them to continue the work safely.

Testing

Testing of electrical equipment must be carried out to confirm the:

- relevant circuits have been de-energised
- status of any other relevant conductors in the work area
- equipment is electrically safe when re-energised.

An electrical worker must be trained and competent in correct test procedures and in the safe use of test instruments and equipment.

Standards for electrical inspection and testing are outlined in AS/NZS 3000 Electrical Installations "Wiring Rules" Section 8 as well as AS/NZS 3017:2022 Electrical installations – Verification by inspection and testing.

When you are undertaking any type of testing – ensure you wear the correct PPE for the type of testing.

Remember:
Testing is "Live" electrical work.

A risk assessment must be completed and should identify the control methods to be followed and the correct type of PPE that must be worn.

Test instruments

The tools, testing equipment and PPE for testing and fault finding must be suitable for the work, properly tested and maintained in good working order.

The correct type of test instruments for electrical testing are outlined in AS/NZS3017 Electrical installations – Verification by inspection and testing.

The minimum test equipment required for electrical testing for de-energisation includes:

- a **voltage indicator** to suit the work activity. The electrical potential (such as voltage level and fault current potential) for the work site will determine the installation category of the instrument, leads and probes that must be used for testing.
- **suitable probes**.

To confirm a positive indication and to establish the circuit voltage level, use a test instrument that incorporates a visual display clearly identifying the voltage level.

Figure 7: Example of a voltage indicator and suitable probe.

Proximity voltage testers are not reliable in proving de-energised and should only be treated as an indicator.

Proximity voltage testers should be tested for correct operations immediately before use and again immediately after use. This is particularly important if the test result indicates zero voltage. This will confirm that the instrument is still working correctly.

Always ensure the test equipment is functioning correctly before and after each test.

Test Instrument standards:

- Test probes and other equipment should be designed and selected so that they cannot inadvertently short circuit between energised conductors or energised conductors and earth.
- The terminals of test equipment should be shrouded. All other test sockets on measuring instruments should be designed so as to prevent inadvertent contact with any energised test socket or conductor when equipment is in use.
- Test leads and testing devices need to be provided with suitable fuse protection, where appropriate.
- Testing equipment, where used in hazardous flammable areas, should be designed and clearly marked as being suitable for use in these conditions.
- Take care to ensure there is no risk of injury to yourself or others when carrying out testing procedures.
- When carrying out mains polarity tests with the multiple earth neutral link disconnected, a temporary shock hazard may arise. The earthing system, including the water piping and associated equipment, can be raised to a voltage above earth potential.
- Take appropriate measures such as using an independent earth as the testing reference point instead of the installation earth or use a high impedance test instrument such as a voltmeter to perform the tests.

Table 3: AS/NZS 3017:2022 Table 2.1 – Impulse voltage and typical use.

Impulse-voltage category	Circuit voltage	Suitable for	Examples
I	**ELV**	Measurements on circuits not directly connected to an LV source of supply	Battery powered circuits, ELV lighting
II	**LV**	Measurements on equipment directly connected to a LV installation	Appliances
III	**LV**	Measurements performed on an LV installation	Final subcircuits, distribution boards, submains
IV	**LV**	Measurements performed at the source of an LV installation	Consumer mains and main switchboards
Note: Category 1 meters are not suitable for testing LV installations.			

Safety in the use of test equipment

The following precautions should be considered when testing to detect or confirm energised conductors:

- Ensure the instrument is the suitable installation category for use on a low impedance source such as main switchboards.
- Always confirm the correct operation of the test device before commencing a test.
- Check correct operation of test device at completion of testing to guard against failure during testing.
- When using testers that require the completion of a circuit to earth, ensure that the earth is effective. An independent earth may be required.
- To prevent personal injury and/or damage to equipment, all test instruments should be capable of withstanding the impulse voltages and fault current levels that may be experienced in the particular installation category.

Personal protective equipment (PPE)

General PPE

The use of protective clothing and equipment is an essential part of working safely. Many electrical workers have avoided serious injury or death because of the clothes and other PPE they were wearing at the time.

Appropriate clothing and PPE provide some (limited) level of protection from:

- electric shock
- flash burns resulting from an arcing fault
- mechanical impacts.

The type of PPE required for a task is dependent on:

- the type of equipment to be worked on
- the potential fault currents at the point of the installation
- other contributing factors.

The risk assessment will determine the type of protection required.

Limitations of PPE

PPE cannot be relied on as the sole risk control measure to provide full protection from electrical hazards.

PPE should be used in conjunction with other risk control measures and be considered as the final safety measure.

PPE must comply with the relevant legislation and Australian technical standards. In particular:

- Work Health and Safety Regulation.
- AS/NZS 4836 (Section 11) provides a guide to the use of PPE for various types of electrical work.
- The Energy Networks Australia publication ENA NENS 09-2014 provides comprehensive guidelines for the selection, use and maintenance of PPE for electrical arc hazards.

Responsibilities for PPE

Employers must ensure their employees wear suitable everyday work clothes and footwear and must provide the necessary additional protective equipment to enable employees to carry out their work safely.

PPE provided to employees must comply with the relevant legislation and Australian technical standards. Employers must ensure that employees are trained in the correct use and care of their PPE so that it provides the level of protection intended.

An apprentice, as with all other workers, must wear clothes and footwear suitable for the type of work. They must also wear any additional protective equipment provided for the work and wear it in the correct manner.

Every electrical worker must ensure that:

- they always use the appropriate PPE for the work undertaken
- their co-workers also use the appropriate PPE
- they maintain their PPE in good condition and replace any defective items.

Basic PPE

Information about basic (minimum) items of PPE is provided in the following sections, for easy reference and guidance.

Safety footwear

Figure 8: Example of safety footwear.

Safety footwear provides protection from:

- electric shock
- falling objects.

Safety footwear must:

- be non-conductive
- comply with technical standard AS/NZS 2210.

Safety glasses

Figure 9: Example of safety glasses.

Safety glasses provide protection from:

- flying objects caused by activities such as grinding and cutting
- electrical arc flash (limited protection only).

Safety glasses must:

- have non-conductive frames
- comply with AS/NZS 1337.

Work gloves

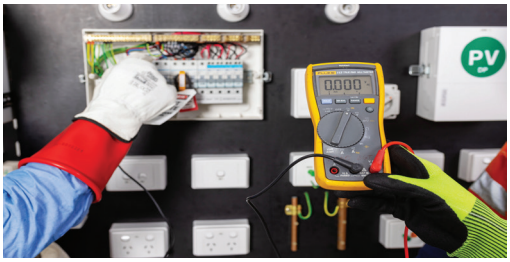


Figure 10: Example of safety gloves.

Work gloves provide protection from mechanical impact in relation to tools, equipment and work materials.

Gloves must:

- have no conductive fasteners such as zips or studs,
- be made of durable material appropriate for the required work
- comply with technical standard AS/NZS 2161.

Safety helmets

Figure 11: Example of safety helmet

Many work sites require safety helmets to be worn all times.

They provide protection from contact with:

- overhead wires/structures
- falling objects.

All helmets must be:

- non-conductive
- comply with AS/NZS 1801.

Residual current devices (RCDs) or safety switches

Figure 12: Example of an RCD.

RCDs on fixed or portable socket outlets provide additional protection against electrocution in the event of electric shock due to:

- inadvertent energisation of equipment being worked on
- malfunction of portable electric tools and extension leads.

RCD protection must be provided in the workplace as required by:

- Work Health and Safety Regulation and technical standard AS/NZS 3012, Electrical installations – Construction and demolition sites.

RCDs should be tested for correct operation before commencing work.

Protective clothing

Many work sites require full body cover protective clothing to be worn at all times. This is also required for certain types of electrical work, such as testing and fault-finding.

Category 1 arc flash protection clothing is required to be worn in some work areas (e.g. in the electricity supply industry).

Protective clothing for electrical work should cover the body completely and:

- be of material with properties equivalent to 185gsm 100 per cent cotton drill or better
- have non-conductive and concealed buttons
- have sleeves to wrist length
- have legs reaching to the footwear.

Additional care should be taken to ensure clothing is reasonably close fitting and remains fastened to avoid catching or entanglement. This is particularly important when working in the vicinity of any moving machinery or rotating equipment.

Additional PPE

For general work, other types of PPE commonly required are:

- hearing protection (earplugs or earmuffs)
- respiratory protection (breathing masks).

Personal protective equipment for electrical work on or near energised equipment and circuits

(Note: Caution – apprentices should not be undertaking work on energised electrical equipment. This section is for your information only).

PPE for electrical work, including testing and fault finding, must be suitable for the work, properly tested and maintained in good working order. The PPE must be able to withstand the energy at the point of work when working energised.

Training must be provided in how to select and fit the correct type of PPE, as well as training on the use and care of the PPE so that it works effectively.

Figure 13: Examples of PPE being worn while working.

Depending on the type of work and the risks involved, the following PPE should be considered:

- **Face protection** – use of a suitably arc flash rated full-face shield may be appropriate when working where there is potential for high current and arcing.
- **Eye protection** – metal spectacle frames should not be worn.

- **Gloves** – use gloves insulated to the highest potential voltage expected for the work being undertaken. Leather work gloves may be considered for de-energised electrical work.
- **Clothing** – use non-synthetic clothing of non-fusible material and flame resistant. Clothing made from conductive material or containing metal threads should not be worn.
- **Footwear** – use non-conductive footwear (e.g. boots or shoes manufactured to a suitable safety standard).
- **Safety belt/harness** – safety belts and harnesses should be checked and inspected each time before use with particular attention being paid to buckles, rings, hooks, clips and webbing.

General safety tips

Metallic jewellery and metal parts on clothing

Conductive jewellery such as wrist watches, rings, chains or piercings must never be worn while carrying out electrical work.

These items can become hazardous and introduce the risk of harm in many ways, including the following:

- Jewellery made of conductive metal may increase the risk of electrocution when working on or near energised electrical equipment.
- Metal jewellery will act as a heat-sink when exposed to high temperatures and can rapidly become extremely hot, resulting in a burn. Jewellery worn under clothing or behind a face-shield will act in a similar manner.
- Accidental contact with energised electrical equipment can rapidly weld metallic jewellery to the equipment and cause severe injury.
- Dangling, protruding or loose jewellery might catch or jam in equipment components or tools and can pull the wearer into moving parts, injuring the wearer and possibly others.
- Even close-fitting items such as rings may present similar hazards in confined spaces.
- Metal parts on clothing or belts should be avoided.
- Underwire bras should also be avoided.

Mobile phone use when testing

Mobile phones are widely used in the workforce. Increasingly they are used to access jobs and documentation such as risk assessments and testing results.

However, there are electrical safety risks involved when using a mobile phone. For example, when performing high risk work such as “Live” electrical testing, it is recommended that you follow safe work procedures when performing testing and do not use your mobile phone when testing.

If in doubt, ask.

Additional resources:

Code of Practice – Managing electrical risk in the workplace

https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0025/72637/managing-electrical-risks-in-the-workplace-cop-2021.pdf

AS/NZS 4836:2023 Safe working on or near low-voltage electrical installations and equipment.

Part 4: Supervision of apprentices

Electrical shocks, accidents and fatalities have occurred when apprentices were not adequately supervised. ***Such incidents are clearly preventable***.

Effective supervision

The importance of effective supervision is recognised by the ES Regulation. All apprentices require effective supervision for their safety as well as for the safety of others.

The ES Regulation section 279 requires that an employer must ensure that an apprentice or a trainee, who performs electrical work, is supervised at all times by a licensed electrical worker.

Only a licensed electrical worker can supervise an electrical apprentice or a permit holder.

The employer and the supervising electrical worker are responsible for determining the appropriate level of supervision for an apprentice.

The key factors to consider for the supervision level are provided below.

1) The type of work

Variations in the work environment, whether related directly to electricity supply or not, present many different circumstances and risks.

Supervising electrical workers must assess these risks when determining safety requirements for the job at hand and the level of supervision appropriate for the apprentice.

These include, but are not limited to:

- work type and location (e.g. residential, commercial, mining)
- new construction or alteration/addition to an existing installation
- proximity to energised electrical equipment on the site and the voltage and maximum fault current of that equipment.

2) Knowledge and skills of the apprentice

The supervising electrical worker must assess the technical knowledge and practical skills of the apprentice. They are informed by both the off-job training record and on-the-job training records. The level of supervision needed for safe working must reflect this assessment.

3) Competence of the supervising electrical worker

Employers must ensure that supervising electrical workers have the necessary competencies to provide effective supervision of an apprentice, including:

- being licensed to carry out the type of electrical work
- appropriate technical knowledge, skills, and experience in regard to the particular work to be performed
- effective communication skills
- preferably, formal training in supervision of other workers.

Levels of supervision ES Regulation section 279

The level of supervision required must be appropriate having regard to:

- the type of electrical work performed
- the adequacy of the apprentices' training
- the competency of the apprentice.

Three different levels of supervision are agreed industry standards and are briefly summarised below.

1) Direct supervision

"Direct" supervision is when a supervisor constantly monitors an apprentice. The supervisor should always remain readily available (within sight and/or earshot).

This level applies where the apprentice requires constant guidance and monitoring by the supervising electrical worker to ensure the work task is carried out safely and correctly.

Direct supervision is usually appropriate where:

- the apprentice is new to the task
- the apprentice has not demonstrated ability to perform the task to a minimum standard
- the assessed risks determine direct supervision is required for the task
- the apprentice has not completed off-the-job training that supports competent performance of the task
- unplanned events are beyond the apprentice's ability to manage
- the work includes "live" work or work near exposed energised parts (apprentices should not be undertaking any "live" work).

2) General supervision

General supervision is when a supervisor is not constantly reviewing the apprentice but remains available in person for assistance or instruction as required. This does not include face time or video conferencing.

This level is used where the apprentice requires periodic guidance and monitoring to ensure the work task is carried out safely and correctly.

The supervising electrical worker must remain on the same work site as the apprentice and be readily available to provide guidance and assistance.

General supervision is usually appropriate where the:

- apprentice has demonstrated their ability to perform the task safely to the minimum standard without the need for constant intervention
- apprentice has demonstrated an understanding of any risks and can manage those risks appropriately
- assessed risks determine general supervision is required for the task
- apprentice has an appropriate level of knowledge and practical skills from completing off-the-job and on-the-job training
- apprentice has demonstrated an ability to manage or seek assistance with reasonably predictable unplanned events.

3) Broad supervision

Broad supervision is when a supervisor only needs to make occasional face-to-face contact at intervals determined suitable by the supervisor.

Adequate apprentice supervision cannot solely be provided from an offsite location by electronic means such as phones, radios, and webcams.

This level applies where the apprentice does not require ongoing guidance and monitoring while performing familiar tasks.

Broad supervision is usually appropriate where:

- the apprentice has demonstrated their ability to perform the task safely to acceptable standards without the need for supervisor intervention
- the apprentice has demonstrated an understanding of any risks and has the ability and demonstrated how to manage those risks appropriately
- the assessed risks determine broad supervision is required for the task
- the apprentice has a significant level of knowledge and practical skills from completing off-the-job and on-the-job training
- the apprentice has demonstrated an ability to manage or seek assistance with unplanned events.

Determining appropriate levels of supervision

The level of guidance required by an apprentice can be expected to diminish gradually over the course of the apprenticeship. The level of supervision would decrease as competence is attained and demonstrated by the apprentice.

The appropriate level should be determined and applied at all times. This is based on the supervising electrical worker's assessment of the apprentice's competence to perform each task. For example, a task being performed for the first time or in an unfamiliar environment in the final year of training may initially require direct supervision for that task.

The Guide for supervision of electrical apprentices table in Appendix 1 provides guidance to employers, supervising electrical workers and apprentices on appropriate minimum levels of supervision of apprentices at different stages of training and for different work types (de-energised only), subject to assessment by the supervising electrical worker.

Work in roof spaces – special precautions required

Electrical Safety Office recommends that workers should not enter the roof space of buildings unless the electrical installation is de-energised.

However, after isolating the network supply and all in-built energy sources, energised cables and equipment may still be present on roofs, in ceiling spaces and wall cavities, associated with:

- network service apparatus
- on site generators or batteries.

Hazardous voltages may also still exist at terminals within the switchboard and other electrical enclosures.

Extra care is required to ensure that workers are not exposed to the risk of contact with energised wiring or equipment even when the circuit(s) to be worked on have been de-energised.

An electrical worker and an apprentice should not enter a roof space unless the electricity is turned off.

Where the work includes "live" electrical work such as testing and fault-finding on an energised circuit, a risk assessment must be undertaken and the risk of electrical shock controlled. In these circumstances, consideration should be given to the use of a safety observer to oversee the safety of the worker.

Tips for supervisors – before commencing work

Before an apprentice commences any electrical work, the supervising electrical worker must:

- ensure you involve the apprentice in the risk management steps
- be confident that the apprentice is fit for work
- ensure there are no exposed energised parts and the electrical equipment is de-energised and safe to be worked on or near
- clearly instruct the apprentice on which tasks he/she is expected to do and which ones he/she must not be doing until he/she is instructed on how to do the tasks. Confirm the apprentice understands the instructions
- advise the apprentice which level of supervision applies to the work and confirm the apprentice understands the limitations

- ensure that the apprentice is equipped with the necessary PPE and tools and understands how to use them correctly
- where the equipment has been de-energised by the supervising electrical worker to allow work to be carried out on or near it, ensure that the apprentice
    - has applied their personal lock and danger tag at the isolation point(s)
    - has verified by an electrical test that the equipment is de-energised – Test for dead before you touch.

As a supervisor of an apprentice or a young worker, be diligent in your role to ensure their safety and ensure you are fair, equitable and consistent in your approach to all in your charge.

Additionally, do not assume that the apprentice can do the task correctly and safely. Verify their competency for the task before allocating the work. If a supervision level other than “Direct” is chosen, confirm with the apprentice that they are comfortable with that level.

You are responsible for their safety on your job and for the electrical safety of the work they perform.

Part 5: Electrical accidents and incidents

Low voltage rescue and resuscitation

Rescue and resuscitation training ES Regulation section 28 – A person conducting a business or undertaking must ensure a worker, who is required to perform or help in performing electrical work, is competent in rescue and resuscitation in accordance with recognised practices in the electricity industry.

All electrical workers and apprentices should have current rescue and resuscitation skills. They should receive ongoing training in rescue and resuscitation procedures by periodically attending a recognised course from a registered training provider (recommended annually).

Safety observer – role and responsibility

A competent safety observer must be present when work is carried out on energised electrical equipment.

There is an exemption to this. If the work is testing and a risk assessment shows that there is no serious risk associated with the proposed work, then a safety observer may not be required – ES Regulation section 22. However, always keep in mind that testing is "live" electrical work and the risks involved in testing energised electrical equipment or circuits still exist and must be controlled. In some instances where the risk is significant, a safety observer may be warranted when "live" testing.

The safety observer should:

- have the knowledge and understanding of the type of electrical work to be undertaken
- be involved in the process for risk assessment and the risk management process to be implemented.

An electrical apprentice should not be acting as a safety observer within the first six months of their training.

The role of the safety observer should be clearly communicated and understood. The safety observer must:

- have a clear understanding of the work being performed and the risks associated with that work
- be positioned such that they can clearly observe the work and warn the worker of danger
- be able to communicate quickly and effectively with the worker carrying out the work
- have the authority to stop the work before the risk becomes high (for an apprentice, have the ability and confidence to stop the work)
- be competent to implement the control measures in an emergency
- be competent to rescue and resuscitate the worker who is carrying out the work, if necessary
- must have been assessed as competent to rescue and resuscitate a person.

The safety observer should:

- not carry out any other work or function that compromises their role (e.g. they should not be required to observe more than one task at a time)
- ensure there is a safety observer for each worker, if two or more electrical workers are undertaking "live" electrical work.
- not be situated in the work basket of the elevating work platform from which the electrical work is being carried out.
- be able to communicate quickly and effectively with the electrical worker carrying out the work. Specialist equipment may be necessary if there is a barrier to communication.
- not have any known temporary or permanent disabilities that would adversely affect their role and performance.

Low voltage rescue kit

A low voltage rescue kit should be on hand when work is carried out on energised electrical equipment. The safety observer must be trained in its use. Prior to use, the worker and safety observer should check the contents of low voltage rescue kits to ensure they are in good condition and are suitable for the work situation. The due date for tests should also be checked to ensure currency.

The low voltage rescue kit contains:

- Bag – orange weatherproof PVC with reflective strip and contents tag
- Blanket – thermal
- Burns dressing – multi trauma 91cm x 20cm
- Burn relief pad 10cm x 10cm
- Burns treatment card A6
- Fire blanket 1.2M x 1.8M (AS/NZS 3504)
- Gloves – insulated 1000V Size 11 (AS 2225)
- Insulated LV rescue hook.

Figure 14: Example of contents of a low voltage rescue kit.

First step in low voltage rescue – isolate the source of electricity

The first critical step before attempting to assist a casualty after an electrical accident is to check for danger to yourself, the casualty and bystanders.

In particular, to ensure that the source of electricity is isolated before anything else is attempted (part of step D in the resuscitation procedure).

- **Low voltage** (230/400V A.C.): Immediately switch off the electricity. If this is not practicable, pull or push the casualty clear of the electrical contact using dry non-conducting material (wood, rope, clothing, plastic or rubber).
- Do not use metal objects or anything moist. The low voltage rescue kit includes an insulated hook designed for this purpose.
- **High voltage** (greater than 1000V A.C.): Wait until disconnection of the electricity is confirmed.

Basic principles of first aid

The purpose of giving first aid to a casualty is to:

- **Preserve life** – check for danger to yourself, the casualty, bystanders.
- **Prevent further injury** – if possible, leave the casualty where they are and render first aid. Move the casualty only if necessary to save their life or prevent further injury.
- **Promote recovery** – help the casualty to breathe, stop bleeding, get trained help, make the casualty comfortable.
- **Protect the unconscious** – clear and open the airway, turn the casualty into the recovery position.

Recovery position

A casualty should be placed into the recovery position when they are unconscious and breathing. This is done while the person administering first aid is waiting for medical assistance to arrive.

Figure 15: Example of how to place someone in the recovery position.

Emergency resuscitation (CPR)

The method of emergency life support is Cardiopulmonary Resuscitation, more commonly referred to as "CPR".

The recommended emergency procedures are sourced from the Australian Resuscitation Council Guideline 8 – Cardiopulmonary Resuscitation (as published in January 2016):

Providing **30 compressions** (at approximately 100/min) and giving **two breaths** (each given over one second per inspiration), should result in the **delivery of five cycles in approximately two minutes**.

Details of the "DRS ABCD" steps in the CPR method are subject to variation from time to time. Persons trained in resuscitation should refresh their knowledge of the procedures on a regular basis (recommended annually).

Further information and training in first aid and resuscitation procedures is available from recognised training providers.

Table 4: Cardiopulmonary resuscitation (CPR) steps - "DRS ABCD".

Cardiopulmonary resuscitation (CPR) steps		
D	**Danger**	Ensure that the patient and everyone in the area is safe. Do not put yourself or others at risk. Remove the danger for the patient.
R	**Response**	Look for a response from the patient – loudly ask their name, squeeze their shoulder.
S	**Send for help**	If there is no response, phone triple zero (000) or ask another person to call. Do not leave the patient.
A	**Airway**	Check their mouth and throat is clear. Remove any obvious blockages in the mouth or noise, such as vomit, blood, food or loose teeth, then gently tilt their head back and lift their chin.
B	**Breathing**	Check if the person is breathing abnormally or not breathing at all after 10 seconds. If they are breathing normally, place them in the recovery position and stay with them.
C	**CPR**	If they are still not breathing normally, start CPR. Chest compressions are the most important part of CPR. Start chest compressions as soon as possible. **Give 30 compressions followed by two breaths (30:2).** Aim for five sets of 30:2 in about two minutes (if only doing compressions about 100-200 compressions per minute).
D	**Defibrillation**	Attach an Automatic External Defibrillator (AED) to the patient if one is available and there is someone else who is able to bring it to the patient. Do not get one yourself if that would mean leaving the patient alone.

Reporting an electrical incident/accident

Electrical workers and apprentices must report all electrical accidents (including all shocks) to their employer. The employer is required to notify the relevant safety office of the incident.

The WHS Act section 38 requires a business owner to report if any of the following happens at the place of work or is caused by the running of the business:

- the death of a person
- a serious injury or illness of a person
- a dangerous incident – including an electrical shock.

For the electrical safety legislation, a business owner must notify the Electrical Safety Office if any of the following happens at the place of work or is caused by the running of the business:

- a serious injury or illness of a person
- a dangerous incident.

A **serious electrical incident** is defined as an incident involving electrical equipment if a person:

- is killed by electricity
- receives a shock or injury from electricity and is treated for it by, or under the supervision of, a doctor
- receives a shock or injury from electricity at high voltage, whether or not the person is treated for it by, or under the supervision of, a doctor.

Any shock or injury to a person from high voltage electricity must be notified, regardless of whether they're treated for it.

A **dangerous electrical event** includes:

- when a person, for any reason, is electrically unsafe around high voltage electrical equipment, even if the person does not receive an electric shock or injury
- significant property damage caused by electricity or something originating from electricity such as a fire caused by electricity
- unlicensed electrical work
- unsafe electrical work
- unsafe electrical equipment or electrical equipment that does not have electrical equipment safety system approval markings.

If you're still unsure if an incident is notifiable call the Electrical Safety Office on 1300 362 128.

Resources for apprentices

Legislation and standards

- Electrical Safety Act and Regulation: https://www.worksafe.qld.gov.au/laws-and-compliance/electrical-safety-law
- Electrical work – Codes of Practice: https://www.worksafe.qld.gov.au/laws-and-compliance/codes-of-practice
- Australian Standards – for electrical work and electrical installation practices - https://infostore.saiglobal.com/en-au/standards/as-nzs-3000-2018-98926_saig_as_as_2802012/?gclid=CjoKCQiA8aOeBhCWARIsANRFrQHyHpeJdqqTO9BWdjj_U_kHKo6M10aox6YUh2hZU6CyMNW7bk64ZJYaAv9IEALw_wcB&gclsrc=aw.ds

AS/NZS 3000 Electrical installations "Wiring Rules"; AS/NZS 3017 Electrical installations – verification by inspection and testing; AS/NZS 4836 Safe working on or near low-voltage electrical installations and equipment.

Industry associations

- Electrical Trades Union – https://www.etu.org.au/
- Employer Associations such as:

Master Electrician Australia (MEA) – https://masterelectricians.com.au/

National Electrical Contractors Association NECA) – https://www.neca.asn.au/

Technical trainers and training packages – https://training.gov.au/Training/Details/UEE

Appendix

Table 5: Guide for supervision of electrical apprentices – types and times by type of work.

Type of work	Typical time served (in months)				
	0 – 6	6 – 12	12 – 24	24 – 36	36 – 48
Installation of cable support and mechanical protection	Direct	Direct/ General	General	Broad	Broad
Installation of low voltage cabling	Direct	Direct/ General	General	General	Broad
Installation of low voltage electrical equipment	Direct	Direct	Direct	Direct/ General	Broad
Fault finding, repair and maintenance of de-energised low voltage electrical installation and equipment	Direct	Direct	Direct	Direct/ General	Broad
Proving de-energised of low voltage electrical installation and equipment (isolation and lock-out)	Direct supervision. The supervisor is ultimately responsible for proving the isolation before work commences.			Direct	Direct/ General[3]
De-energised verification (visual inspection and testing) of low voltage electrical installation and equipment	Direct	Direct	Direct	Direct/ General	General[4]/ Broad[5]
Energised verification (visual inspection and testing) of low voltage electrical installation and equipment	RTO Simulated only	RTO Simulated only	RTO Simulated only	RTO Simulated only	Direct
Commissioning (testing for correct operation/function) low voltage electrical installations and equipment (no access to exposed low voltage)	Direct	Direct	Direct	Direct/ General	General[6]

3 General supervision should be restricted to apprentices who have completed training in isolation and lock-out procedures and the supervisor has performed a risk assessment and ensured the apprentice is competent to undertake the task.
4 General supervision is only appropriate after the apprentice has completed the relevant units of competency in installation verification.
5 Broad supervision should only be considered after the apprentice has successfully completed their Capstone assessment.
6 General supervision is only appropriate after the apprentice has successfully completed the relevant units of competency in installation verification.

Notes