



Safe working guidelines for electrical workers and apprentices

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Contents

Preface	3	7. Electrical isolation and de-energisation of equipment	31
1. Terms and definitions	4	7.1 Essential steps for effective de-energisation	31
2. Responsibilities	6	7.2 Securing the isolation with locks	32
2.1 General	6	7.3 Danger tags	32
2.2 Employer responsibilities for supervising electrical workers	7	7.4 Out-of-service tags	32
2.3 Employer responsibilities for apprentices	7	8. Personal protective equipment (PPE)	33
2.4 Supervising electrical worker responsibilities	8	8.1 General PPE requirements	33
2.5 Apprentice responsibilities	9	8.2 Responsibilities	34
2.6 Licensing	9	8.3 Basic PPE	34
2.7 Work standards	10	9. Rescue and resuscitation	37
3. Supervision of electrical workers	11	10. Reporting and investigation of electrical accidents	38
3.1 Effective supervision	11	10.1 Duties of an employer	38
3.2 The work environment	12	10.2 Duties of an employee	38
3.3 Knowledge and skills of the electrical worker	12	10.3 Investigations of electrical accidents	38
3.4 Supervising electrical worker's competence	13	Appendix 1: Assessment and testing of apprentice's knowledge of workplace safety	39
3.5 Levels of supervision	13	Assessment guidelines	39
3.6 Limit to the number of persons supervised	14	Eligibility to conduct interview and test	39
3.7 Supervision of apprentices	15	Assessment	39
3.8 Level of supervision for holders of provisional licenses	16	Appendix 2: Physiological effects of electric shock	40
4. Dangers and risks when doing electrical work	17	Appendix 3: Methodology for assessing the level of supervision for an apprentice (de-energised work only)	41
4.1 Managing risk using the hierarchy of control	17	Appendix 4: Rescue and resuscitation	42
4.2 Electrical risks	18		
4.3 Non-electrical risks	22		
5. Safe working practices	24		
5.1 Before starting work	24		
5.2 When working	25		
5.3 On completion of the work	25		
5.4 General safety practices	26		
5.5 Tools	26		
6. Working on or near energised electrical equipment	27		
6.1 Exceptions for working on or near energised electrical equipment	28		
6.2 Safe approach to carrying out live electrical work	28		
6.3 Work in roof spaces	29		
6.4 Precautions required for installations with embedded generators or batteries	29		
6.5 Work near overhead power lines	30		
6.6 Restrictions on apprentices working on or near energised equipment	30		

Preface

Every electrical worker must be constantly vigilant about electrical hazards when carrying out electrical work. The danger is real.

This booklet covers basic electrical safety practices to be followed by all electrical workers and provides advice on:

- Achieving and maintaining safe work practices, for the benefit of the individual worker and for the benefit of others.
- Effective supervision of licensed electrical workers with varying competencies.
- Responsibilities of employers and electrical apprentices to ensure apprentices have sufficient basic trade safety knowledge prior to being granted an electrician's training license. Safe working practices and procedures are an integral part of the electrical trade and must be the first skills learned.

These guidelines are designed to complement the Electricity (Licensing) Regulations 1991 in matters specifically related to the licensing and safety of electrical workers. General workplace safety requirements and responsibilities of Person Conducting a Business or Undertaking and employees are covered by the *WA Work Health and Safety Act 2020* and the *Work Health and Safety Regulations 2022*. In all instances, the requirements of an Act and the Regulations prevail.

Note: Every care has been taken to ensure references to legislation, Australian Standards and other documents in the guidelines are accurate at the time of publication. However, amendments to these documents are made from time to time and the reader should always check to ensure that applicable referenced information is current.



1. Terms and definitions

Terms and definitions used within this document have a meaning as defined within the relevant legislation e.g. the Electricity (Licensing) Regulations 1991 (ELR).

Technical terms and words have the meaning as stated within the relevant industry standards, e.g. AS/NZS 3000.

This guideline aims to provide clarity where possible between terms used in legislation and relevant industry standards. However, where conflicts in terms or definitions exist, the terms and definitions within legislation shall prevail.

The following terms and definitions have been replicated where possible to allow this guideline to be printed and used without reference to other documents:

Agent – means:

- a person who carries on a business of providing workers to carry out work for clients of the person; and
- includes a group training organisation as defined in the *Industrial Relations Act 1979* section 7(1).

Apprentice – has the meaning given in the *Vocational Education and Training Act 1996* section 60A.

Building – means a Class 1, Class 2 or Class 10a building as classified under the Building Regulations 2012.

De-energised – in relation to a part of an electrical installation, means separated from each supply of electricity to the part in such a way that the part cannot be inadvertently energised.

Electrical equipment – includes any component or part of an electrical installation.

Electrical worker in training – means an electrical worker who is an apprentice or who is undergoing a course of training.

Energised – in relation to a part of an electrical installation, means connected to a supply of electricity to the part, whether or not electricity is flowing through any part of that part.

Employer of an electrical worker in training – means a person who employs an *electrical worker* in *training* and includes an *agent* who, under a *labour hire arrangement*, makes the services of the worker available.

Labour hire arrangement – exists if:

- an agent has for remuneration agreed with a client to provide an electrical worker to carry out electrical work for the client;
- there is no contract of employment between the electrical worker and the client in relation to the electrical work;
- there is an agreement (which may be a contract of employment) between the electrical worker and the agent as to the carrying out of electrical work including in respect of remuneration and other entitlements; and
- that agreement applies to the carrying out of the electrical work by the electrical worker for the client.

Licensed electrical worker – means the holder of an electrical worker's licence or the holder of a permit as described under Part 3 of the ELR and replicated below:

- a) An **electrician's licence** and the work authorised by the licence may be carried out without supervision.
- b) An **electrician's training licence** and the work authorised by the licence shall be effectively supervised by the holder of an electrician's licence in accordance with ELR regulation 50(4) and as further explained in this guideline.
- c) A **restricted licence** authorises the holder of the licence to carry out electrical work (including testing) for the purposes of the holder's trade but does not authorise the holder of the licence to carry out the installation or alteration of fixed wiring.
- d) A **permit** that authorises the person to whom it is issued, subject to restrictions and conditions, if any, as may be specified in the permit, to carry out the electrical work that would be authorised by a licence of the corresponding kind. A permit may be issued subject to conditions for supervision that are more stringent than the level of supervision applicable to holders of a licence of the corresponding kind.

Live – means in relation to any wire or other object, having under normal conditions of operation, an electrical potential difference between that wire or other object and earth, and any conductive part that is deemed by the Australian/New Zealand Wiring Rules to be a live part for the purposes of that standard, shall be regarded as live for the purposes of these guidelines.

Person employing an electrical worker in training – includes a person who, by arrangement with the employer or agent of an electrical worker in training, is making use of the services of the electrical worker, whether or not the arrangement is principally for the purpose of training the electrical worker.

Roof space of a building – means the space in the building that is immediately underneath the roof; or if there is a ceiling under the roof, or a part of the roof, the space between the roof, or that part of the roof, and the ceiling. Roof space does not include an attic in the roof space.

Supervising electrical worker – means a person supervising the electrical work of an electrical worker meeting the requirements of ELR regulation 50(3).

Working on or near – The term "on" or "near" has the meaning given in ELR regulation 54A(2) of the ELR and are explained in detail below.

- a) **Working on** – means working in contact with a part of an electrical installation that is connected to a supply of electricity, whether or not electricity is flowing through any part (i.e. it can be energised with a voltage, but load current may or may not be present).
- b) **Working near** – means when a person is carrying out the work, the body of, or any tool, vehicle, or other equipment used by or controlled by the person, may make contact, directly or inadvertently with an uninsulated energised part of the electrical installation. The term "work near" does not apply if the energised part is safely and securely shielded or barricaded by design or if the part is fully insulated such that direct or inadvertent contact cannot be made.

2. Responsibilities

Employer and employee responsibilities for maintaining workplace safety are set out in Sections 19 and 28 of the *Work Health and Safety Act 2020* (WHS). Under the WHS, an employer is defined as a Person Conducting a Business or Undertaking (PCBU). For the purpose of this guideline, the term employer will be used to align with the *Electricity (Licensing) Regulations 1991*.

Employers and persons supervising other electrical workers in training have duties and responsibilities to ensure a safe system of work is established and maintained.

2.1 General

Employers have the primary duty of care to maintain a safe working environment for employees by providing information and training, safe work procedures, safety equipment and effective supervision.

Employees also have a duty of care to ensure their own safety and to avoid any act or omission which adversely affects the safety of others during the performance of their work. Employees must cooperate with employers, follow safe work procedures and use protective equipment.

Electrical contractors who employ electrical workers and apprentices are deemed to be employers for the purpose of this guideline. An electrical contractor must not perform the role of supervising electrical worker unless they are the holder of an electrical worker's licence or permit and have the necessary competencies to provide effective supervision of the electrical work.

An agent under a labour hire arrangement, as defined within ELR regulation 50AA, retains the duties of the employer and they are not transferred to the client.

The duties of the supervising electrical worker may be formally transferred to the client's supervising electrical worker under a labour hire arrangement or contract.



2.2 Employer responsibilities for supervising electrical workers

Employers have duties and responsibilities, but not limited to the following, for supervising electrical workers:

- Ensure that supervising electrical workers are the holders of a current electrical worker's licence or permit and have the necessary competencies to provide effective supervision of another electrical worker.
- Have regard to the level of competence and ability of the person who is to provide the supervision.
- Create the environment, facilities and means to enable the supervising electrical worker to provide effective supervision.
- Ensure, as far as is practicable, that the supervising electrical worker determines, on an ongoing basis, the appropriate level of supervision for the electrical work of apprentices.
- Ensure, as far as is practicable, that the supervising electrical worker:
 - does not supervise the electrical work of more than two electrical workers whose electrical work requires supervision if the electrical work of at least one of them requires direct supervision; and
 - does not, in any case, supervise the electrical work of more than four electrical workers whose electrical work requires supervision.
- Ensure, as far as is practicable, that:
 - the supervising electrical worker understands their responsibilities; and
 - the apprentice knows who their supervising electrical worker is.

2.3 Employer responsibilities for apprentices

Employers have duties and responsibilities, but not limited to the following for electrical apprentices under training:

- assess the electrical apprentice's knowledge of safe working principles and practices (based on the information in these guidelines) and provide a formal assessment report to the Electrical Licensing Board. Further details of the required assessment process are provided in [Appendix 1, page 39](#);
- provide suitable training to ensure that electrical apprentices maintain necessary safe work standards and achieve the required competencies;
- establish and maintain an individual file/record of each electrical apprentice's progress and performance. The records must include dates, successful performance of key work practices and other important details for future reference;
- provide electrical apprentices with, to the greatest extent possible, experience in a wide variety of electrical installing work types, to ensure that a broad range of electrical knowledge and skills has been obtained at the completion of training;
- obtain details of the experience and level of competence of the apprentice in carrying out electrical work tasks;
- consider the type of electrical work to be carried out by the apprentice, especially whether the work will be carried out on or near a part of an electrical installation that is connected to a supply of electricity;

- consider the location and general circumstances in which the electrical work is to be carried out;
- ensure, as far as is practicable, that the apprentice does not carry out electrical work on or near an energised part of an electrical installation unless in the final year of their apprenticeship, the work relates to fault-finding or testing, they are authorised to do so and provided with direct supervision;
- ensure the work environment allows the electrical apprentices to feel empowered to speak up in relation to the need for more experience in certain areas of the trade or highlight any safety concerns or risks that they feel need to be addressed; and
- report all electrical accidents to the relevant network operator.

2.4 Supervising electrical worker responsibilities

This guideline complements the requirements to provide supervision of the electrical work under regulation 50 of the ELR. The level of supervision required may or may not extend to include additional duties of care, including the requirements for a PCBU to provide adequate supervision of a worker under the WHS Act. Where the supervising electrical worker is unclear of their responsibilities, they shall seek clarity from their employer.

The role of supervising electrical worker carries specific regulatory duties under the ELR, which are separate to any supervisory role required by other Acts or Regulations or company policies.

A supervising electrical worker who is supervising the electrical work of an electrical worker (i.e. supervised worker) must:

- Consider the type of electrical work to be carried out by the supervised worker, especially whether the work will be carried out on or near a part of an electrical installation that is connected to a supply of electricity.
- Consider the location and general circumstances in which the electrical work is being carried out.
- Consider the complexity of the work and the level of competence of the supervised worker.
- Determine the appropriate level of supervision required for the various tasks that make up the electrical work of the supervised worker; and provide the required level of supervision.
- Ensure supervised workers do not carry out electrical work on or near an energised part of an electrical installation except under the following conditions:
 - supervised worker is in the final year of training;
 - the work is limited to fault-finding or testing;
 - only if assessed by the supervising electrical worker as being competent to perform the task safely;
 - only under direct supervision, with the supervising electrical worker in close proximity to the supervised worker for the duration of the task; and
 - supervising electrical worker has undertaken all risk assessments and implemented risk controls.

- Ensure, as far as is practicable, that the supervised worker:
 - knows who their supervising electrical worker is;
 - knows which level of supervision applies to their electrical work; and
 - understands that, in relation to carrying out electrical work, they are not to take instructions from anyone other than their supervising electrical worker.
- Provide a good mentoring environment where electrical apprentices feel empowered by their supervisor and safety concerns or risks are taken seriously and addressed.
- Help electrical apprentices to interpret and respond to new work contexts, offering opportunities to demonstrate their capabilities and assist with verifying workplace experience records or logbooks.
- Report all electrical accidents to the employer.

2.5 Apprentice responsibilities

Electrical apprentices have duties and responsibilities, but not limited to the following:

- Work closely with the employer and supervising licensed electrical worker to achieve a high standard of safety and workmanship. In particular, always follow instructions and safe working procedures provided by your supervising licensed electrical worker.
- May refuse to carry out any electrical work, when in relation to that work, it is considered:
 - that competency to carry out the work has not been achieved; or
 - that work would, or would likely, endanger the apprentice or another person.
- If ever in doubt about anything, the apprentice should consult the supervising electrical worker or employer.
- Expect to feel empowered to raise with employers and supervisors the need for more experience in certain areas of the trade or if there are any safety concerns or risks that need to be addressed.
- Report to your supervisor anything that appears unsafe or at risk to you or others.
- Report all electrical accidents to your employer.

2.6 Licensing

Both the employer and the employee have the responsibility to ensure that the employee has the appropriate current license, as set out in the ELR, to lawfully perform electrical work on behalf of the employer, while observing any restrictions applicable to the individual license.

2.6.1 Electrician's training license

Both the employer and the electrical apprentice have the responsibility to ensure that an electrician's training licence is obtained before the apprentice carries out any electrical work. An apprentice must obtain an electrician's license, at the completion of their apprenticeship, before they can carry out electrical work lawfully as a tradesperson.

Applications for licenses must be made to the Director of Energy Safety at the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS).

2.7 Work standards

All licensed electrical workers are responsible for the safety of their own work and the ongoing electrical safety of ordinary persons who are the owners and end-users of an electrical installation. Licensed electrical workers should expect ordinary persons to have little knowledge or training in the dangers associated with using or operating electrical equipment. Full compliance with industry standards ensures an installation that is fit for purpose and poses very little risk to its end-users.

Regulation 49B of the ELR requires that, to the extent practicable and reasonable, an electrical worker is to ensure that when electrical work has been carried out by them:

- the thing on which the work was performed is safe to use; and
- the work has been completed to a trade finish.

Supervising electrical workers are responsible for checking and testing all electrical work carried out by an electrical apprentice or person undergoing training to ensure compliance with the ELR.

This includes, but is not limited to, compliance with:

- AS/NZS 3000 Wiring Rules;
- The WA Electrical Requirements;
- Technical standards listed in Schedule 2 of the ELR; and
- Code of Practice for Persons Working on or Near Energised Electrical Installations.



3. Supervision of electrical workers

Electrical accidents and fatalities have occurred when electrical workers were not adequately supervised. Such incidents are clearly preventable. The importance of effective supervision is recognised by regulation 50 of the ELR. These guidelines will assist you in understanding these obligations and for improving workplace safety.

3.1 Effective supervision

Electrical work is not required to be supervised if:

- the person carrying out the electrical work is authorised by a licence or permit to carry out the electrical work in question without supervision; or
- the person carrying out the electrical work is not required under the ELR to be authorised by a licence or permit to carry it out (i.e. a person working on service and metering equipment on behalf of a major network operator).

Apprentices and some new employees require effective supervision for their safety and training and the safety of others. The responsibility for determining the appropriate level of supervision rests with the employer and the supervising licensed electrical worker. In deciding on the appropriate level of supervision for an electrical worker, based on a particular scope of work or task, the supervising licensed electrical worker must consider all relevant factors including, but not limited to, the environment, skill levels and type and complexity of the work.

Whether you are an employer, supervising licensed electrical worker or an electrical worker under supervision, it is important to understand your obligations under the ELR.

ELR regulations 50, 50AA and 50AB provide detailed requirements for effective supervision of workers for the purpose of preventing danger to life and property.

Effective supervision includes, but is not limited to:

- ensuring that all workers are licensed to carry out the required work;
- adequate job-planning, risk assessment and risk mitigation;
- ensuring the supervising electrical worker has the necessary knowledge and experience required for the type of work to be undertaken, giving due consideration to the level of training, knowledge and experience of the electrical worker(s) who are being supervised; and
- managing the number and proximity of electrical workers to enable the required level of oversight and clear lines of communication.

3.2 The work environment

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 electrical worker.

These include, but are not limited to:

- work type and complexity, e.g. residential, commercial, mining, etc;
- new construction or alteration/addition to an existing installation, the likelihood of the presence of electrical and non-electrical hazards;
- proximity to energised electrical equipment on the site;
- the voltage and maximum fault current of that equipment;
- adverse weather conditions (if outdoors);
- working at heights;
- location and remoteness of the work site and traveling to and from; and
- fatigue due to working or traveling for long periods.

3.3 Knowledge and skills of the electrical worker

The supervising electrical worker must assess the technical knowledge and practical skills of the electrical worker or apprentice using information available from both academic and on-the-job training records.

The level of supervision needed for safe working must reflect this assessment.

3.4 Supervising electrical worker's competence

Employers must ensure that supervising electrical workers are the holders of a current electrical worker's licence or permit and have the necessary competencies and willingness to provide effective supervision of another electrical worker, including:

- being the holder of a current and appropriate licence or permit that allows the electrical work to be carried out without supervision;
- appropriate technical knowledge, skills and experience in regard to the particular work to be performed;
- effective communication skills; and
- preferably, formal training in supervision of other workers.

3.5 Levels of supervision

Three different levels of supervision are defined in detail in ELR regulation 49D and are briefly summarised below.

3.5.1 Direct supervision

“Direct” supervision applies where an apprentice requires constant guidance and monitoring by the supervising electrical worker to ensure the work task is carried out safely and correctly.

A supervising electrical worker provides direct supervision of the electrical work of an apprentice if the supervising electrical worker:

- is as far as is practicable, present in the immediate work area at all times;
- can observe the work of the apprentice;
- both workers are able to communicate directly;
- is in close proximity to the apprentice at all times while electrical work is carried out on or near an energised part of an electrical installation (final year of training);
- provides instructions and demonstrates the correct procedures for carrying out the work;
- monitors the work and provide guidance and checks; and
- when the electrical work is complete, checks and tests the work to ensure that the work is safe, complies with the Regulations and is carried out to a trade finish.

3.5.2 General supervision

“General” supervision applies where the apprentice or Provisional License holder requires periodic guidance and monitoring to ensure the work task is carried out safely and correctly.

A supervising electrical worker provides general supervision of the electrical work of a supervised worker if the supervising electrical worker:

- Is present at the place where the electrical work is being carried out, at all times.
- While the electrical work is being carried out:
 - provides instruction and direction, as required;
 - is readily available to provide advice and guidance;
 - periodically monitors the work; and
 - checks, as required, that the work complies with the Regulations and is carried out to a trade finish.
- When the electrical work is complete, checks and tests the work to ensure that the work is safe, complies with the Regulations and is carried out to a trade finish.

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

3.5.3 Broad supervision

"Broad" supervision applies where the worker does not require ongoing guidance and monitoring while performing familiar tasks.

A supervising electrical worker provides broad supervision of the electrical work of a supervised worker if the supervising electrical worker:

- Visits the supervised worker at the place where the electrical work is being carried out, at least once per day.
- Before the electrical work commences, provides instruction and direction, as required, regarding the electrical work.
- While the electrical work is being carried out:
 - is readily available or contactable to provide advice and guidance; and
 - checks, as required, that the work complies with the Regulations and is carried out to a trade finish.
- When the electrical work is complete, checks and tests the work to ensure that the work is safe, complies with the Regulations and is carried out to a trade finish.

The supervising electrical worker does not need to remain on the same site as the supervised worker but must, as a minimum, attend the work daily to provide initial instruction and to verify the electrical work has been carried out safely and correctly.

3.6 Limit to the number of persons supervised

The number of persons that can be supervised at any time by a supervising electrical worker is limited dependent upon the level of supervision the person is under.

A supervisor cannot supervise the work of more than two electrical workers who require supervision if at least one of the workers requires direct supervision.

If the supervisor is NOT providing direct supervision to a worker, then the maximum number of electrical workers they can supervise is four at any time.

Number of Apprentices	Levels of Supervision Permitted
No more than two apprentices	One Direct; One Broad or General
No more than four apprentices	Four Broad or General combination

3.6.1 Supervision of apprentices

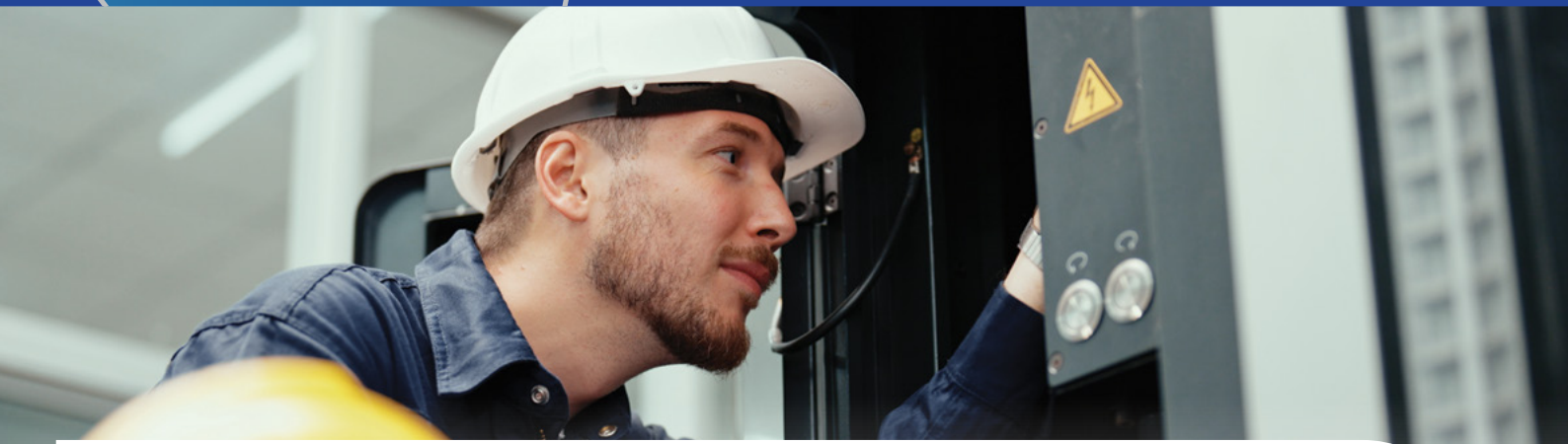
Before an apprentice commences any electrical work, the supervising electrical worker must:

- Be confident that the apprentice is fit for work.
- Ensure there are no exposed live parts, and the electrical equipment is de-energised and safe to be worked on or near.
- Clearly instruct the apprentice on which tasks are expected to be undertaken and which tasks must not be done until instructed on how to do the tasks.
- Confirm that the apprentice understands the work instructions.
- Advise the apprentice which level of supervision applies to the work and confirm the apprentice understands the limitations that applies to the work.
- Ensure that the apprentice is equipped with the necessary personal protective equipment (PPE) and tools and understands how to use them correctly.
- Where the equipment has been de-energised to allow work to be carried out on or near, ensure that the apprentice:
 - has applied their personal lock and danger tag at the isolation point(s); and
 - has verified by an electrical test that the equipment is de-energised – **TEST BEFORE YOU TOUCH.**

3.6.2 Determining the appropriate levels of supervision for apprentices

The following table provides guidance to employers and supervising electrical workers 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.

Type of work (de-energised only)	Apprentice Training year	Recommended minimum supervision level
New electrical installations (not connected to electricity supply)	1st 2nd 3rd 4th or final	General General Broad Broad
Maintenance, alterations, and additions to existing electrical installations (isolated and proven de-energised by supervising electrical worker)	1st 2nd 3rd 4th or final	Direct General General Broad
Workshop assembly and maintenance of electrical equipment (not connected to electricity supply)	1st 2nd 3rd 4th or final	General General Broad Broad
Tag and lockout procedure on de-energised installations and equipment (isolated and proven de-energised by supervising electrical worker)	1st 2nd 3rd 4th or final	Direct General General Broad
Testing and fault-finding on de-energised installations and equipment (not connected to electricity supply or isolated and proven de-energised by supervising electrical worker)	1st 2nd 3rd 4th or final	Direct Direct General General



The level of guidance required by an apprentice can be expected to diminish gradually over the course of the apprenticeship, as increasing competence is attained and demonstrated by the apprentice. However, the appropriate level should be applied at any time 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 particular task.

The levels of supervision applied in practice will vary from the recommended minimum levels subject to a diligent assessment by the supervising electrical worker of the nature of the work, the specific circumstances and risks, and the competence of the apprentice to perform the task (i.e. energisation of equipment – apprentice to verify).

The methodology for assessing the level of supervision for an apprentice (de-energised work only) is captured within [Appendix 3, page 41](#).

3.6.3 Restrictions for apprentices working on or near energised equipment

Work on or near energised electrical circuits and equipment by any electrical apprentice is prohibited by the ELR except in certain prescribed circumstances as provided within [Section 6.6, page 30](#).

3.6.4 Testing and fault finding by an apprentice

The ELR permits an electrical apprentice to carry out isolation, testing and fault finding on energised equipment under strictly limited circumstances as provided within [Section 6.6, page 30](#).

3.7 Level of supervision for holders of provisional licenses

An Electrical Worker's Electrician's Provisional License is issued to a person who applies through an overseas pathway and is required to enable the provisional licence holder to gain up to 12 months on-the-job practical experience under Western Australian conditions while they complete their gap training.

The licence authorises them to carry out electrical installing work under general supervision of a licensed electrician whilst employed by the holder of an Electrical Contractor's License or In-House Installing Work License.

4. Dangers and risks when doing electrical work

There are many dangers that an employee or employer may be exposed to whilst at work during the course of the working day. These dangers could include both electrical and non-electrical risks. It is recommended that you take the time to familiarise yourself with some of these risks by visiting worksafe.wa.gov.au/work-health-and-safety-guides.

4.1 Managing risk using the hierarchy of control

The hierarchy of control can be used as an effective tool to deal with health and safety issues at work. You should use control measures from as high on the hierarchy of control list as possible. If that is not possible the next option down the list or a combination of the measures should be implemented. The least effective control measure is the use of personal protective equipment (PPE), and it should be used as a last resort or as a support to other control measures to minimise the consequence or severity of an accident. Information and training should be integrated with all levels of control to explain how controls work.

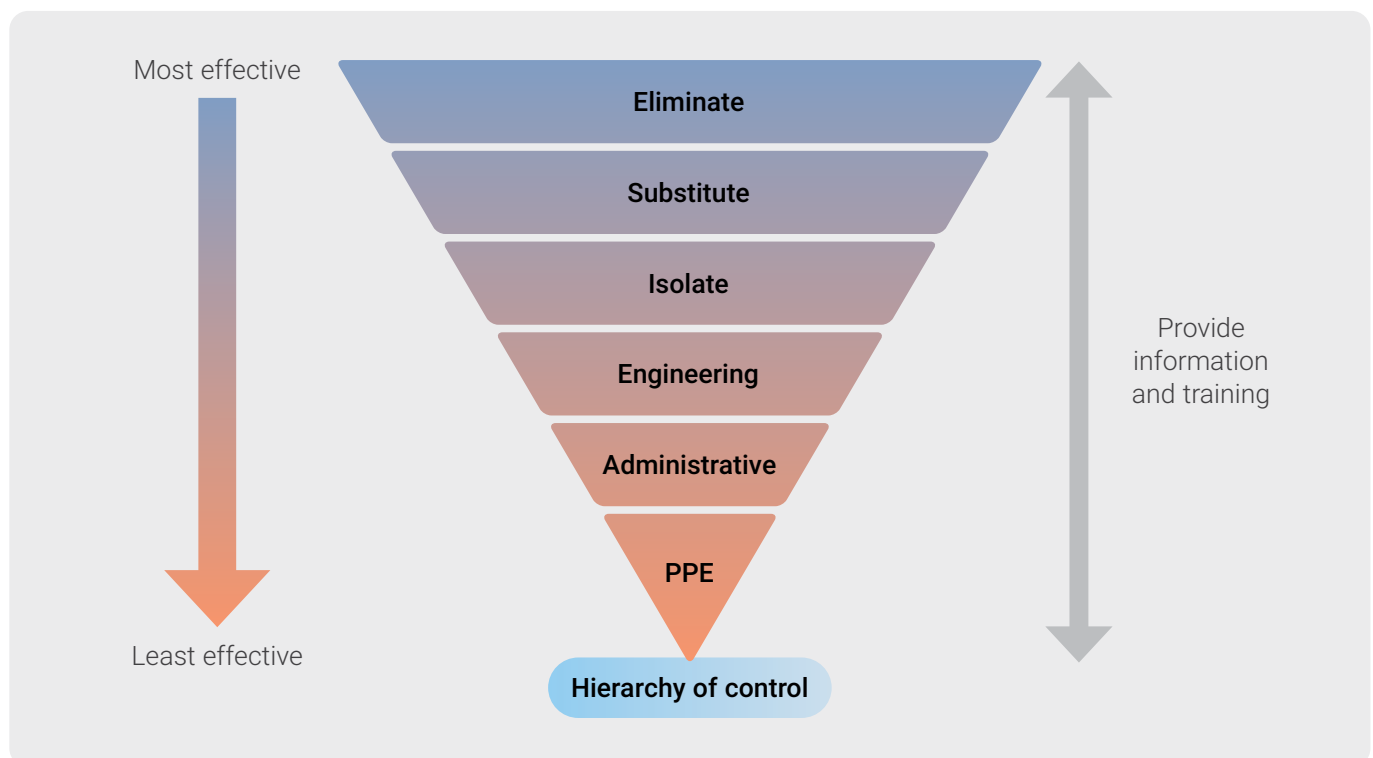


Figure 1: Hierarchy of control

4.2 Electrical risks

The most common electrical risks and causes of injury



Electric shock causing injury or death



Burns from arcing, explosion or fire



Fire resulting from an electrical fault

Figure 2: Common electrical risks and cause of injury

It only requires a very small failure of a work practice, such as a slip with a screwdriver or a dropped tool, for such accidents to occur. These risks will be discussed in more detail in the following sections:

4.2.1 Electric shock

The human body is a conductor of electricity. A current will flow through body tissues when contact is made simultaneously with two objects which are at different voltage potentials. For example, if two terminals of different voltage 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 conducting material in contact with earth. Contact may also be made by tracking through or across a medium (e.g. wet areas), or by arcing.

Electric shock is the effect produced on the body, particularly the nervous system, by an electrical current. The effect varies depending upon the magnitude, path and frequency of the current and the duration of contact, (even the briefest contact with electricity can have serious consequences). If the current magnitude is within a certain range and its path traverses the heart region, the normal rhythm of the heart can be interrupted. In this state, known as ventricular fibrillation, the heart contracts randomly 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 the victim's breathing. "Electrocution" means death resulting from an electric shock. It is recommended that anyone who has experienced an electric shock presents to a medical facility as soon as possible for an ECG no matter how minor the shock is.

Electricity supply systems in Australia typically operate at 230 volts AC phase to earth and 400 volts AC phase to phase. A shock at these voltages can be fatal. Hence, it is essential that adequate precautions are taken to ensure no person comes into contact with any 'live' electrical equipment or conductors. A high-voltage shock (of 1,000 volts or more) may inflict other forms of serious injury, such as severe burns and organ failure. Under normal circumstances, voltages below 50 volts AC generally are not harmful to humans.



However, they must still be treated with respect, especially in wet or polluted areas. Direct Current (DC) is also hazardous and although the effects are similar to AC, the magnitude of safe body current and duration differs to that for AC.

The physiological effects of electric shock based on magnitude and duration are shown within [Appendix 2, page 40](#).

Further guidance on the risk of electric shocks, considering different contact scenarios, voltages and durations can be found in:

- AS/NZS 60479.1 – Effects of current on human beings and livestock.

4.2.2 Residual Current Devices (RCDs)

RCDs on fixed or portable socket outlets provide additional protection against electrocution. They are designed to reduce the risk by detecting an imbalance between active and neutral conductors and automatically disconnecting the circuit, limiting the magnitude and duration of the current that flows through the body to earth when a shock occurs. They provide protection against electrocution, but they do not prevent the shock from happening in the first place.

RCDs are extremely effective at protecting ordinary persons who may come into contact with live exposed conductive parts of electrical appliances. In this contact scenario, the touch voltage will almost certainly appear between a part of the body in contact with the appliance and earth, causing the RCD to operate as it was designed.

Under certain fault scenarios, RCDs have limitations on how they work and are somewhat ineffective. Electrical workers are more likely to encounter these scenarios if working on or near live parts of an installation or of an appliance that are not accessible to ordinary persons. RCDs will not provide protection under the following conditions, because there is likely to be insufficient residual current to operate the RCD:

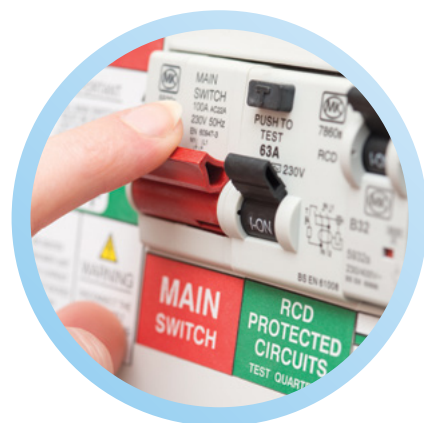
- A person connected between phase and neutral conductors.
- A person bridging an open circuit active conductor.
- A person bridging an open circuit neutral conductor.

RCDs should not be relied upon as the sole means for preventing electrocution while undertaking electrical work. The circuits or equipment to be worked on must be disconnected from all sources of electricity supply, the isolation points physically secured to prevent inadvertent re-energisation, and proven to be de-energised before the work is commenced. Where work on or near energised electrical equipment is the only option (i.e. testing or fault finding), the work shall be done in accordance with Section 6: Working on or near energised electrical equipment.

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

- Regulation 164.2 of the WHS Regulations; and
- Technical standard AS/NZS 3012 Electrical installations – Construction and demolition sites.

Where used on handheld tools and equipment RCDs should be tested for correct operation before commencing work.



4.2.3 Arc flash

An arc flash is a hazard that can cause serious injury or death. An arc fault occurs when current flows through the air between electrically conductive parts. It is an unexpected, violent, electrical short circuit that ionizes the air to create a plasma cloud of molten metal at temperatures up to 20,000°C. In extreme cases, it can also result in a pressure wave that creates a deafening noise that can result in hearing loss or, in extreme cases, even break bones.



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

Arcing faults can occur at any time for a variety of reasons. However, they generally occur as a result of an external influence which, typically, may involve the actions of a worker, for example, during maintenance or whilst operating electrical equipment.

Employers, licensed electrical workers and owners of electrical installations can all play an important part in the effective management of arc flash hazards by initiating:

- An assessment of the risk of arc flash in accordance with IEEE 1584 or similar standards.
- Determine the likelihood of personnel being exposed to an arc flash event with consideration of the work tasks being performed.

Treat the risk using the hierarchy of controls:

- Eliminate the exposure by only interacting with de-energised and isolated equipment.
- Substitute manual operating systems for automated systems.
- Isolate personnel from the hazard by using equipment designed for arc fault containment or using barriers to keep people away whilst the equipment is energised.
- Using engineering controls to redesign the equipment or parts of the installation such as fast acting electrical protection systems.
- Administrative controls such as labelling equipment within substation or switchgear rooms, installing visible arc boundaries, developing company policies with respect to live work, work procedures, training and restricting access to live parts of an at-risk installation.
- The use of suitable PPE is the least effective control on its own but can be effective at reducing the severity of injuries by providing a heat proof barrier over the body parts exposed to the arc flash, but PPE becomes ineffective at high fault levels where the pressure wave and impact from airborne debris can be fatal. PPE must be used in combination with other controls (such as fast acting protection systems) where working on or near energised equipment cannot be avoided.

This guideline supports the objectives of legislation that aims to provide a safe work environment for electrical workers but only briefly covers the topic of arc flash.

More detailed guidance, as required to develop safe work practices and to select the appropriate PPE, can be found within the following publications:

- Arc Flash Hazard Guidelines, available at energycouncil.com.au; and
- International Standard IEEE 1584-2018 – Guide to performing Arc Flash Hazard Calculations, available at standards.ieee.org.

4.2.4 Electrical fires

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

The following are likely causes of electrical fires:

- Arc flash.
- Short circuits.
- Lack of routine maintenance and damaged or faulty equipment.
- Old or defective wiring.
- Loose connections, faulty switchgear or fuse gear.
- Imbalanced electrical loads.
- Overheating due to overloaded circuits.
- Poorly designed protection systems or ineffective protection settings.

Installing equipment in accordance with the manufacturer's instructions, that is fit for purpose, has the appropriate rating and is compliant with the relevant industry standards ensures an installation that is fit for purpose and poses very little risk to its end-users.

When installing equipment ensure passive fire prevention methods such as sealing of cable entries, fire barriers and fire-resistant coatings, where required by the National Construction Code, are installed and remain intact upon completion of all electrical installing work.

Additional information on wiring systems and a copy of the National Construction Code can be found in the following:

- AS/NZS 3000 – Section 3, selection and installation of wiring systems;
- AS/NZS 3013 – Classification of fire and mechanical performance of wiring system elements;
- AS/NZS 3008 – Selection of cables; and
- National Construction Code, visit ncc.abcb.gov.au.



4.3 Non-electrical risks

Some of the most common non-electrical risks that workers within the electrical industry can be exposed to whilst at work are:

4.3.1 Asbestos

Asbestos was previously used within the electricity industry in a number of industrial and residential areas such as switch board panels, ceilings, roofs, fencing, floor coverings, laggings, sprayed insulation and in many other areas where a non-conductive, heat resistant material was needed.

Inhalation of asbestos fibres can cause asbestosis, lung cancer and mesothelioma. Asbestos is a serious issue for Australia and will continue to be so for many years, despite the ban on new uses of asbestos in 2003.

Managing and working with asbestos requires strict controls, in accordance with the WorkSafe codes of practices:

- how to manage and control asbestos in the workplace; and
- how to safely remove asbestos.

For more information on how to identify and deal with asbestos in the workplace, visit worksafe.wa.gov.au/asbestos.



4.3.2 Poisoning

Burning and arcing associated with electrical equipment 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.

For more information on how to identify and deal with dangerous chemicals in the workplace, visit worksafe.wa.gov.au/guidance-about-hazardous-chemicals.

Some of these dangerous chemicals are briefly discussed in the following sections.



4.3.2.1 Mercury

Mercury is used in batteries, metering equipment, sensors, floodlights, streetlights, and florescent lights. Mercury is liquid at room temperature and is easily vaporised at ambient temperatures. When mercury is released into the atmosphere it can be very toxic to humans and enters the food chain where it eventually travels to the oceans and is commonly detected in seafood. Items that contain mercury need to be handled carefully, whilst using the appropriate PPE, to ensure its container remains intact. All items that contain mercury, including light globes, should be recovered as hazardous waste and not disposed of as general waste or in land fill.

For more information on how to identify and deal with mercury at home or in the workplace, read the Clean-up guide for small mercury spills in the home, available at healthywa.wa.gov.au.

4.3.2.2 Polychlorinated Biphenyls (PCBs)

Polychlorinated Biphenyls (PCBs) are a group of synthetic chlorinated organic compounds used in oils for their good insulating and fire-resistant properties. PCBs have been used in many industrial products such as capacitors and transformers. PCBs have now been classified as Group 1, Carcinogenic to Humans.

For more information on how to identify and deal with PCBs in the workplace, visit worksafe.wa.gov.au/publications/safe-handling-pcbs.

4.3.2.3 Sulphur hexafluoride gas (SF6)

Some high voltage switchgear uses sulphur hexafluoride gas (SF6) as an insulating medium. SF6 may irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath. If released into a switch room, SF6 gas can displace the air causing suffocation to anyone who enters the room. SF6 is also a very stable chemical, with an atmospheric lifetime greater than 1,000 years. As the gas is emitted, it accumulates in the atmosphere and remains in an un-degraded state for many centuries. Thus, a relatively small amount of SF6 can have a significant impact on global climate change. All emissions of sulphur hexafluoride (SF6) are reportable in accordance with *National Greenhouse and Energy Reporting Act 2007*.

For more information on how to identify and deal with SF6 gas in the workplace, read the Reporting hydrofluorocarbons and sulphur hexafluoride gases guideline, available at cer.gov.au.

4.3.3 Falls

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

For additional guidance on how to manage the risk of falls at a workplace, visit worksafe.wa.gov.au/publications/managing-risk-falls-workplaces-code-practice.

4.3.4 Excavation

Installation of cable systems, switchboards, substations and other equipment outdoors generally involves some sort of excavation. Excavation failure occurs very quickly, giving a worker virtually no time to escape, especially if the collapse is extensive and the excavation is a deep trench. This can result in potentially fatal crush injuries or suffocation.

WorkSafe has published a code of practice that sets out industry-wide guidelines for establishing and maintaining a safe working environment wherever excavation, including trenching, is carried out.

For more information on excavation safety, visit worksafe.wa.gov.au/publications/code-practice-excavation.



5. Safe working practices

The following can be used as a guide for employers or licensed electrical workers who develop safe work practices:

5.1 Before starting work

- Plan the job carefully, including a risk assessment and isolation requirements.
- Ensure all workers have the appropriate PPE for the task and its condition is in good working order. PPE will provide only limited protection from electrical risks such as electric shock, arc flash and arc blast.
- If work is in the vicinity of energised electrical equipment and if required by the risk assessment, ensure workers have a low voltage (LV) rescue kit.
- Check if the upstream electrical protection has a maintenance setting that enables an immediate circuit trip if any fault occurs.
- Confirm permission to isolate (comply with any access or vicinity permit system applicable to the site or the owner / operator of the electrical installation).
- Isolate the electrical equipment or circuit.
- Secure the isolation by fitting personal locks and “Danger” or “Out of Service” tags (as applicable) on the isolating device(s).
- Erect safety barriers where required.
- Cover adjacent live apparatus with insulating barriers where required to do so by the risk assessment.
- **TEST BEFORE YOU TOUCH:**
 - always test for no voltage before starting work;
 - check test instruments before and after every test;
 - always test for the presence of a touch voltage before making contact with exposed conductive parts of switchboards or other equipment; and
 - if a volt stick detects a voltage on exposed metallic parts use an independent earth to confirm a dangerous touch voltage is present, then isolate the circuit immediately. Where safe isolation is not possible barricade to make safe and call the network operator to isolate the supply to the installation.
- Ensure test instruments are fit for purpose and adequately rated (e.g. Category IV for service entry level, etc).
- Use the correct earthing equipment.
- Start work only when authorised to do so.

5.2 When working

- Always wear the PPE required for the work.
- Use only the correct tools and safety equipment suitable for the work.
- Never put yourself or others at risk.
- Use safety observers where required.
- Never rely on your memory about work conditions – if unsure about anything, check visually or re-test.
- Disconnect conductors in order – the active first, the neutral second and the earth last.
- Connect conductors in order – the earth first, then the neutral and the active last.
- Ensure electrical connections are properly torqued to the equipment manufacturer's specified settings.
- For electrical connections on equipment that may be subject to vibrations, mark fasteners with a texter or a punch so loose connections can be visually identified. Clamp cables into place to prevent movement and don't rely on electrical connections to mechanically support cables.
- Check equipment nameplates to ensure correct ratings.
- Do the "tug test" on cables after they have been terminated and before energisation to ensure the connection is sound and there is no movement.
- Check the isolation points and re-test before resuming work after a break – **TEST BEFORE YOU TOUCH.**

5.3 On completion of the work

- Check that tools are not left on or in the job.
- Remove personal earthing equipment (where applicable).
- Check that the work is complete and has been tested.
- Notify all personnel directly involved in the work that the equipment will be energised.
- Remove your "Danger" or "Out of Service" tags and locks.
- Check all "Danger" tags, "Out of Service" tags, earths and locks have been removed by other workers.
- Remove and store all safety barriers and other equipment.
- Relinquish your work permit (if relevant).
- Follow all testing and commissioning procedures.
- Wear the correct PPE required for switching operations based on the risk and fault levels.
- Energise equipment and confirm correct operation, including restoration of normal electrical protection settings (if applicable).



5.4 General safety practices

- Keep a well maintained first aid kit handy.
- Know the electric shock and resuscitation procedure.
- Know where fire extinguishers are located and how to operate them.
- Keep exit and egress paths clear and free from obstruction.
- Know the correct type of fire extinguisher for the various types of fires.
- Keep your workplace clean and orderly.
- When working near energised electrical equipment, have an LV rescue kit for immediate use if required.
- Report all electrical accidents to your employer (who must report the accident immediately to the relevant network operator).

5.5 Tools

- Use the correct tools for the job at hand.
- Regularly check, clean and maintain all tools and equipment and recertify (where applicable).
- Use residual current devices (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.

6. Working on or near energised electrical equipment

Work on or near energised electrical equipment is generally prohibited and should be avoided whenever possible. Electrical installing work must not be carried out on or near energised equipment except in the circumstances and manner as defined in ELR regulations 49 and 55.

ELR regulation 55 does not apply to electrical work carried out by or on behalf of a major network operator on or near their service apparatus.

The limited circumstances in which energised work is permitted and the strict precautions that are required to maintain safe working conditions are prescribed in:

- Work Health and Safety Regulations 2022 (WHS Regulations);
- Regulation 49 and 55 of the Electrical (Licensing) Regulations 1991; and
- Code of Practice for Persons Working on or Near Energised Electrical Installations (published by Building and Energy), available at [wa.gov.au/government/publications/code-of-practice-persons-working-or-near-energised-electrical-installations](https://www.wa.gov.au/government/publications/code-of-practice-persons-working-or-near-energised-electrical-installations).

Industry standard AS/NZS 4836 – Safe working on or near low-voltage and extra low voltage electrical installations and equipment provides principles, guidelines, practices and recommended safe working procedures for work on or near energised electrical equipment. Whilst this industry standard can be used by employers and supervisors to develop their own working procedures the definitions of “working on or near” differ somewhat to the requirements within the ELR. Where this conflict in terms or words exist, the definitions within Legislation shall prevail.

The exceptions and approach to restricted work on energised electrical equipment, as required by the ELR, are summarised in the following sections for ease of reference.



6.1 Exceptions for working on or near energised electrical equipment

Work on or near energised electrical equipment may only be undertaken where the supervising licensed electrical worker has determined it is the only practical option because:

- A risk assessment has been completed by a competent person, who is familiar with the type of work to be carried out, is satisfied that there is no alternative to working live. For example:
 - it is necessary that the electrical equipment to be worked on is energised in order for the work to be carried out effectively (e.g. testing, commissioning, switching, fault-finding); or
 - de-energising that part of the installation would put the health and safety of a person at significant risk (e.g. it may be necessary for life- saving equipment to remain energised and operating while electrical work is carried out on the premises).
- And the risk assessment demonstrates that the risks can be reduced to a minimum practical level and the work can be performed safely.
- If Regulation 299 of the Work Health and Safety (General) Regulations 2022 (that covers high risk construction work) does not apply to the work, then a safe work method statement must still be prepared in accordance with regulation 299(2) and (3) of those regulations (as if the work were high-risk construction work and is to be done at a construction site).
- Suitable safety and personal protective equipment are used by the persons carrying out the work.

Note: Loss of production by itself is not a satisfactory reason for working on energised equipment.

6.2 Safe approach to carrying out live electrical work

Where work on energised equipment is the only option, the required approach to carrying out the work is set out in the following documents:

- Regulation 55 of the Electricity (Licensing) Regulations 1991; and
- Regulation 148 of the Work Health and Safety Regulations 2022.

A comprehensive risk assessment must be conducted by a competent person, who may be the supervising electrical worker. The risk assessment must consider, but not be limited to:

- the fault level;
- specific arc flash containment within the design of the equipment;
- if the designer of the equipment or installation intended to allow it to be worked on live and the manufacturers or designers' recommendations/procedures for how maintenance and repair work is to be done live are to be followed;
- likely direction of an arc blast; and
- adequacy of electrical protection settings.

The identified risks and control measures implemented must be documented in a written "safe work method statement" and a record kept for at least two years after the work is completed.

The work must be undertaken only in accordance with the pre-determined work method, and further detailed guidance that is provided in the Code of Practice for Persons working on or near energised electrical installations.

6.3 Work in roof spaces

The WHS Regulations generally prohibit non-electrical workers entering the roof spaces of buildings unless the electrical installation is de-energised.

Persons licensed to carry out electrical installing work may enter a roof space without de-energising the electrical installation provided the conditions of ELR regulation 55(2) are satisfied. A risk assessment must be performed to determine the risk level and appropriate risk control measures documented in a safe work method statement and implemented.

However, where the work is done on the installation in a de-energised state, additional care shall be taken after isolating the network supply and in-built energy sources (such as direct or inverter connected generators and batteries to the extent that isolation facilities permit), because energised cables and equipment may still be present on roofs, in ceiling spaces and wall cavities. These live cables may be associated with:

- network service apparatus;
- on site generators or batteries (including PVs and renewable energy sources); and
- terminals within the switchboard and other electrical enclosures.

When working on alterations to existing electrical installations, (particularly those with in-built energy sources), 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.

For more information about working in roof spaces, visit worksafe.wa.gov.au/publications/guidance-note-working-roof-spaces.

6.4 Precautions required for installations with embedded generators or batteries

When working on installations with in-built energy sources (such as direct or inverter connected generators and batteries), extra care is required to ensure that workers are not exposed to the risk of contact with energised wiring or equipment even when the network supply has been isolated.

Generation equipment may have on board batteries and protection or control circuits that remain live after the main supply has been isolated. These circuits may operate at hazardous voltages. Where present, signage and additional isolators should be installed and operated to allow both electrical (and non-electrical workers where appropriate) to work safely on relevant parts of the generator without the risk of electric shocks or injury because a remote start operation has been initiated.



6.5 Work near overhead power lines

An employer, or a person with control of, a workplace must ensure that parts of a worker's body or any plant, vehicle, tools, equipment or material used or controlled by the worker does not enter the danger zone of an overhead power line.

The danger zone of an overhead power line is:

- anywhere that is at the same height as, higher than, or not more than the specified distance lower than, the power line conductors; and
- is directly above or below, or not more than the specified distance to either side of, the power line conductors.

The specified distance for the danger zone is within three metres for an overhead power line carrying electricity at a nominal voltage of not more than 33,000 volts and six metres for an overhead power line carrying electricity at a nominal voltage of more than 33,000 volts.

6.6 Restrictions on apprentices working on or near energised equipment

Work on or near energised electrical circuits and equipment by any electrical worker is prohibited by the Electricity (Licensing) Regulations 1991 except in certain prescribed circumstances and subject to performing a detailed risk assessment and formal documentation of a safe work method statement.

6.6.1 Testing and fault finding

The ELR permits an electrical apprentice to carry out isolation, testing and fault finding on energised equipment in the following strictly limited circumstances (in combination):

- only in the final year of training;
- only if assessed by the supervising electrical worker as being competent to perform the task safely; and
- only under direct supervision, with the supervising electrical worker in close proximity to the apprentice for the duration of the task.

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

The limited circumstances in which energised work is permitted and the strict precautions that are required to maintain safe working conditions are prescribed in the previous sections of this document.

7. Electrical isolation and de-energisation of equipment

Before commencing any electrical work, the circuits or equipment to be worked on must be disconnected from all sources of electricity supply, the isolation points physically secured to prevent inadvertent re-energisation, and proven to be de-energised.

It is essential that all apprentices observe the de-energisation procedure. Once appropriately trained (within the fourth year of the apprenticeship), they must take part in and safely perform (under direct supervision) the de-energisation procedure in order to gain a sound working knowledge of this essential safe working practice.

7.1 Essential steps for effective de-energisation

Principles and safe practices for the effective de-energisation of electrical circuits and equipment are provided in Building and Energy's Code of Practice for persons working on or near energised electrical installations, available at wa.gov.au/government/publications/code-of-practice-persons-working-or-near-energised-electrical-installations.

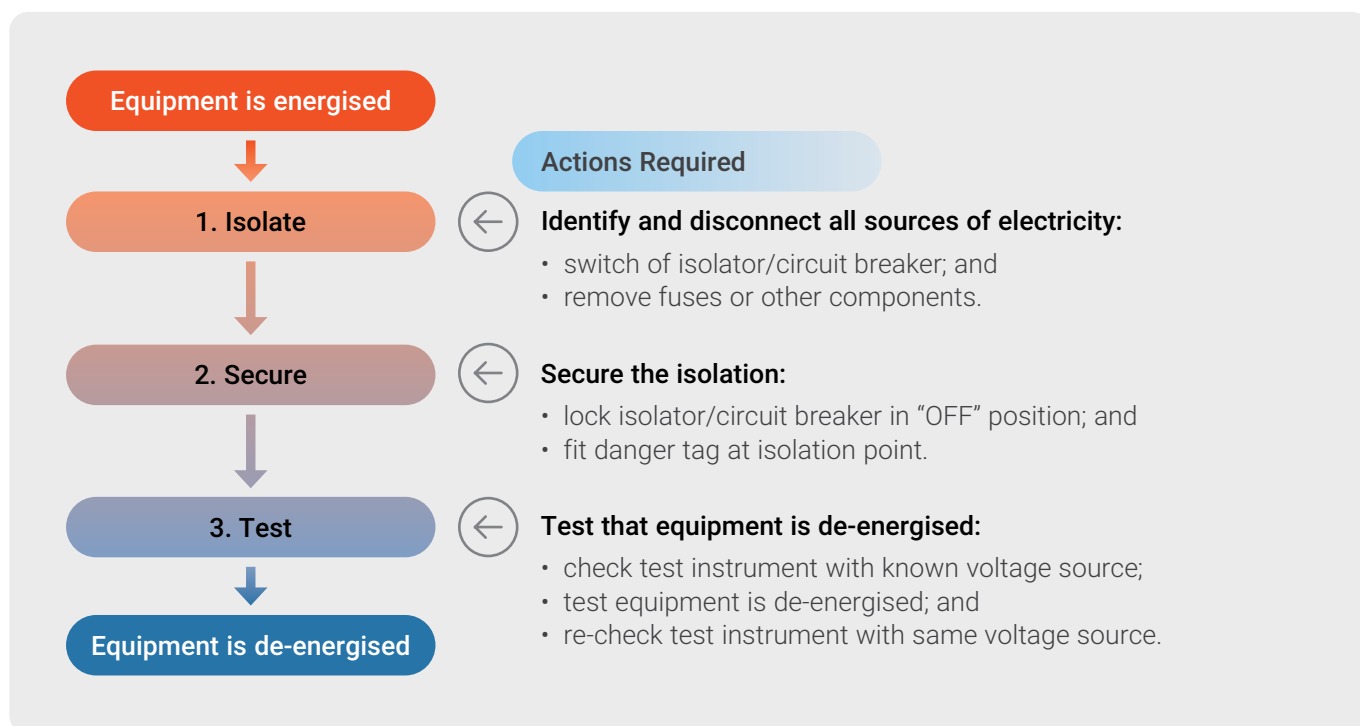


Figure 3: Key steps of Building and Energy's Code of Practice

7.2 Securing the isolation with 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.

Locks are for the safety of personnel and:

- 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 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 (with a personal identification tag or Danger tag) to identify the owner and the nature of the electrical work being undertaken; and
- 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).

7.3 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.

Danger tags are for the safety of personnel and:

- they must be attached in a prominent position at each isolation point;
- they must be fitted and removed only by the person who signed the tag;
- all persons involved in carrying out the work must fit their own Danger tag at the same isolation point(s); and
- they must 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).



7.4 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.

Out-of-Service tags are for the safety of personnel and security of equipment and must be:

- attached in a prominent position at the point of isolation of the appliance or equipment that is being worked on; and
- fitted and removed only by authorised persons.



8. Personal protective equipment (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.

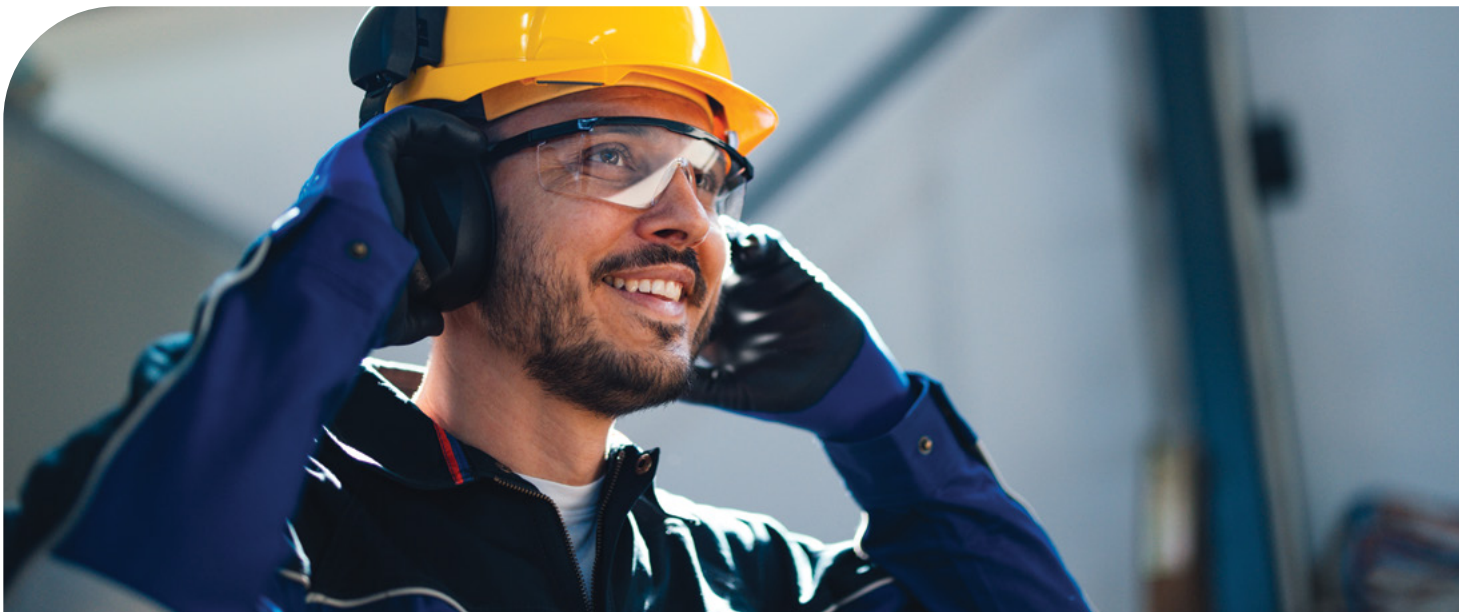
8.1 General PPE requirements

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

- electric shock;
- flash burns resulting from an arcing fault; and
- mechanical impacts and cuts from sharp objects.

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

- the WHS Regulations – provide general requirements and technical standards for PPE used in Western Australia;
- AS/NZS 4836 – Safe working on or near low-voltage and extra low voltage electrical installations and equipment, (Section 11) provides a selection guide for PPE for various types of electrical work; and
- the Energy Networks Australia publication ENA NENS 09-2014 – national guideline for the selection, use and maintenance of personal protective equipment for arc hazards.



8.2 Responsibilities

8.2.1 Employer's responsibilities

The employer 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;
- provide additional safety equipment required for specific electrical work tasks, such as insulated gloves, insulated covers/barriers and thermally rated clothing; and
- ensure that employees are trained in the correct use and care of their PPE so that it provides the level of protection intended.

8.2.2 Electrical workers' responsibilities

Employees must wear suitable clothes and footwear at all times and use the additional protective equipment provided for the work in the correct manner.

Every electrical worker must ensure that:

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

8.3 Basic PPE

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

8.3.1 Safety footwear

Safety footwear shall be suitable for the work environment and provide protection from:

- falling objects and sharp objects;
- be non-slip; and
- protect against electric shock and must be non-conductive.

Safety footwear shall comply with AS/NZS 2210 – Safety footwear.



8.3.2 Safety glasses

Safety glasses provide protection from flying objects caused by activities such as grinding and cutting and electrical arcs (limited protection only).

Safety glasses must have non-conductive frames and comply with AS/NZS 1337 – Personal protective equipment, eye and face protection.



8.3.3 Work 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; and
- be made of durable material appropriate for the required work.

Work gloves shall comply with AS/NZS 2161 – Industrial safety gloves and mittens.

Insulated gloves should be worn in conjunction with cotton inner gloves and an outer pair of protective gloves such as goat skin that must be replaced when damaged to ensure ongoing integrity of the insulated gloves. Insulated gloves must be tested and replaced periodically as required by AS 60903.



Insulated gloves shall comply with and be tested in accordance with AS 60903 – Live working electrical insulating gloves.

8.3.4 Safety helmets

Many work sites require safety helmets to be worn at all times. They provide protection from contact with overhead wires, structures and falling objects.

All helmets must:

- provide protection against mechanical impacts and sharp objects; and
- be non-conductive.

Helmets shall comply with AS/NZS 1801 – Industrial safety helmets.

In some weather conditions, where there is no risk of falling objects making contact with the worker's head, a more appropriate form of sun protection may be required.



8.3.5 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.

Clothing provides some (limited) level of protection from electric arcing/flash burns, flying or falling objects and electric shock.

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; and
- 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.

8.3.6 Additional PPE

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

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

Additional PPE should be considered for some types of electrical work, such as testing and fault-finding. Depending on the assessment of the risks involved, this may include:

- flame retardant clothing;
- insulated gloves;
- arc rated equipment – clothing, gloves, face shield, etc;
- insulating covers/mats;
- low voltage (LV) rescue kit; and
- safety harness.

Advice on fire rated PPE can be found within the Energy Council's Electrical Arc Flash Hazard Guidelines, available at energycouncil.com.au.



9. Rescue and resuscitation

All electrical workers and their assistants should have current rescue and resuscitation skills. The ELR regulation 32E requires a licensed electrician to have completed an initial CPR training course within three years of obtaining a license. Refresher training is required on a three yearly basis however, most training service providers recommend annual refresher training.

The recommended method of CPR (cardiopulmonary resuscitation) is that published by the Australian Resuscitation Council in Guideline 8 – Cardiopulmonary Resuscitation, available at [anzcor.org/home/basic-life-support](https://www.anzcor.org/home/basic-life-support).

Detailed steps in the recommended CPR method are subject to variation from time to time. All electrical workers should regularly refresh their knowledge of the procedures (recommended annually). Further information and training in rescue and resuscitation procedures is available from recognised training providers.

Guideline 8 – Cardiopulmonary Resuscitation has been replicated within [Appendix 4, page 42](#).



10. Reporting and investigation of electrical accidents

Regulation 63 of the ELR, requires the reporting of electrical accidents, including electrical shocks.

An electrical accident means an accident that:

- results from a sudden discharge of electricity or that otherwise has, or is likely to have, an electrical origin; and
- causes, or is likely to cause, danger to life, a shock or injury to a person or loss of or damage to property.

10.1 Duties of an employer

Immediately after a person becomes aware that an electrical accident has taken place, the person is to report the accident to the following:

- a) The relevant electricity network operator. The relevant network operator's contact details can be found within the appropriate section of the Western Australian Electrical Requirements (WAER) via [wa.gov.au/organisation/building-and-energy/information-electrical-licence-holders](https://www.wa.gov.au/organisation/building-and-energy/information-electrical-licence-holders).
- b) If the person is unable to identify the relevant network operator, report the accident to the Department of Energy, Mines, Industry Regulation and Safety via **FREECALL 1800 678 198** (all hours).
- c) The employer must also notify WorkSafe about electrical accidents as prescribed in Section 38 of the *Work Health and Safety Act 2020* if the accident occurs at a workplace. To notify WorkSafe phone **FREECALL 1800 678 198** (all hours).

10.2 Duties of an employee

Immediately after an employee becomes aware that an electrical accident has taken place at the employee's workplace, he or she is to report the accident to the employer concerned and the employer is then to report the accident.

10.3 Investigations of electrical accidents

Electricity network operators and Building and Energy investigate all electrical accidents, including electric shocks. In this way, the cause of the incident can be determined, and actions can be taken to minimise the risk of a recurrence.

Regulation 63A of the ELR makes it an offence if a person does anything at the location where an electrical accident has occurred with the intention of hindering or obstructing an investigation. However, where possible without disturbing the scene, and without placing yourself at risk, you can assist an investigator by taking and providing photos or videos of things that have contributed to the accident such as failed or faulty equipment or unsafe installations.

Appendix 1

Assessment and testing of apprentice's knowledge of workplace safety

Assessment guidelines

The ELR require apprentices to be assessed as having adequate knowledge of safety principles and practices prior to obtaining an electrician's training license. Regulation 22(3) states: A licence endorsed as an electrician's training licence shall not be issued to a person unless the Board is satisfied that the person has been assessed as satisfactory in relation to safety in the manner approved by the Board.

In accordance with these guidelines, the employer is responsible for:

- 1) Providing the apprentice with a copy of this booklet.
- 2) Carrying out an interview to assess whether the apprentice:
 - a) understands his/her and other's safety responsibilities as detailed in this booklet, including:
 - i) apparel and personal protective equipment (required to perform the job safely); and
 - ii) supervision requirements (work he/she can carry out without supervision and when he/she requires supervision).
 - b) has a sound knowledge of rescue and resuscitation procedures.
- 3) supervising a written test (Apprentice Safety Assessment Test) of the apprentice or arranging to have an independent assessor carry out the test.
- 4) completing the Apprentice Safety Assessment Report Form and providing it to the Electrical Licensing Board.
- 5) ensuring that the apprentice attends a basic course (minimum) in CPR by a reputable service provider within one month of engagement. Relying on gaining this essential knowledge from this booklet or other means is not sufficient.

Eligibility to conduct interview and test

The person conducting the assessment (the assessor) must be an electrician, licensed to carry out the electrical work without supervision for which the apprentice is to be indentured.

Assessment

The assessor will evaluate the responses to the test questions. A score of at least 80 per cent correct answers must be achieved, with satisfactory responses in the general interview, to enable the assessor to assure the Electrical Licensing Board that the apprentice's knowledge of trade safety justifies the issue of an electrician's training license.

If the assessor is confident that the apprentice meets the requirements (based on the results of the interview and the written test), the Assessment Report is to be completed. On the other hand, if the assessor is not confident about the apprentice's competence, the apprentice should be given more time and instruction and then be reassessed.

The Apprentice assessment safety guidelines test and report forms are available at wa.gov.au/government/publications/apprentice-safety-assessment-guidelines-test-and-report.

Appendix 2 | Physiological effects of electric shock

The likely physiological effects of electric shock on a healthy adult are illustrated in the following two figures. This graph explains the effects on the human body for a left hand-to-feet contact scenario with variations in the amount of alternating electric current (AC) at 50Hz flowing and time of exposure:

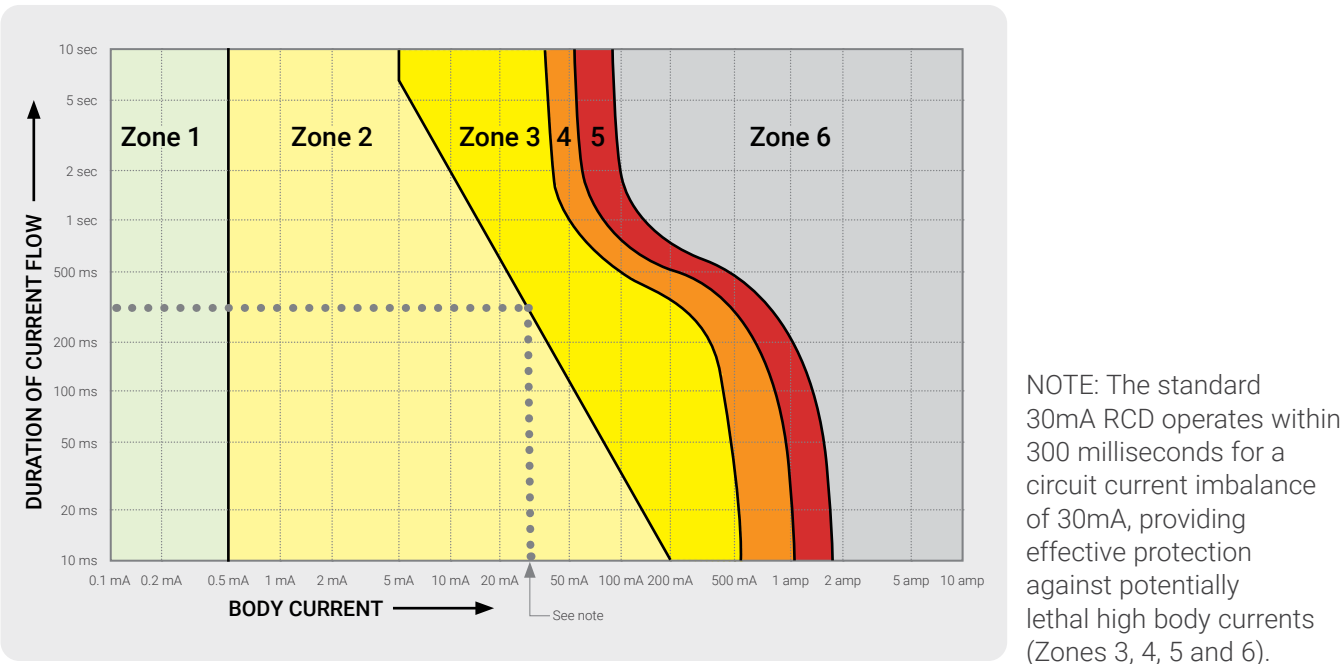


Figure 4: Effects of electric shock on the human body

Zone	Effects of electric shock on the human body	
1	Perception possible but usually no ‘startled’ reaction	
2	Perception and involuntary muscular contractions likely, but usually no harmful effects	
3	- Strong involuntary muscular contractions, difficulty in breathing. - Reversible disturbances of heart function. Immobilisation may occur. - Effects increasing with current magnitude. Usually, no internal organ damage expected.	
4	Patho-physiological effects may occur: - cardiac arrest - breathing stops - burns - internal organ damage - injuries may result in DEATH.	Probability of ventricular fibrillation up to about 5 per cent
5		Probability of ventricular fibrillation up to about 50 per cent
6		Probability of ventricular fibrillation above 50 per cent

Appendix 3

Methodology for assessing the level of supervision for an apprentice (de-energised work only)

Adaptation of the levels of supervision can be done using the following methodology, provided that the recommended minimum levels of supervision of [Section 3.7.1, page 15](#) are still met:

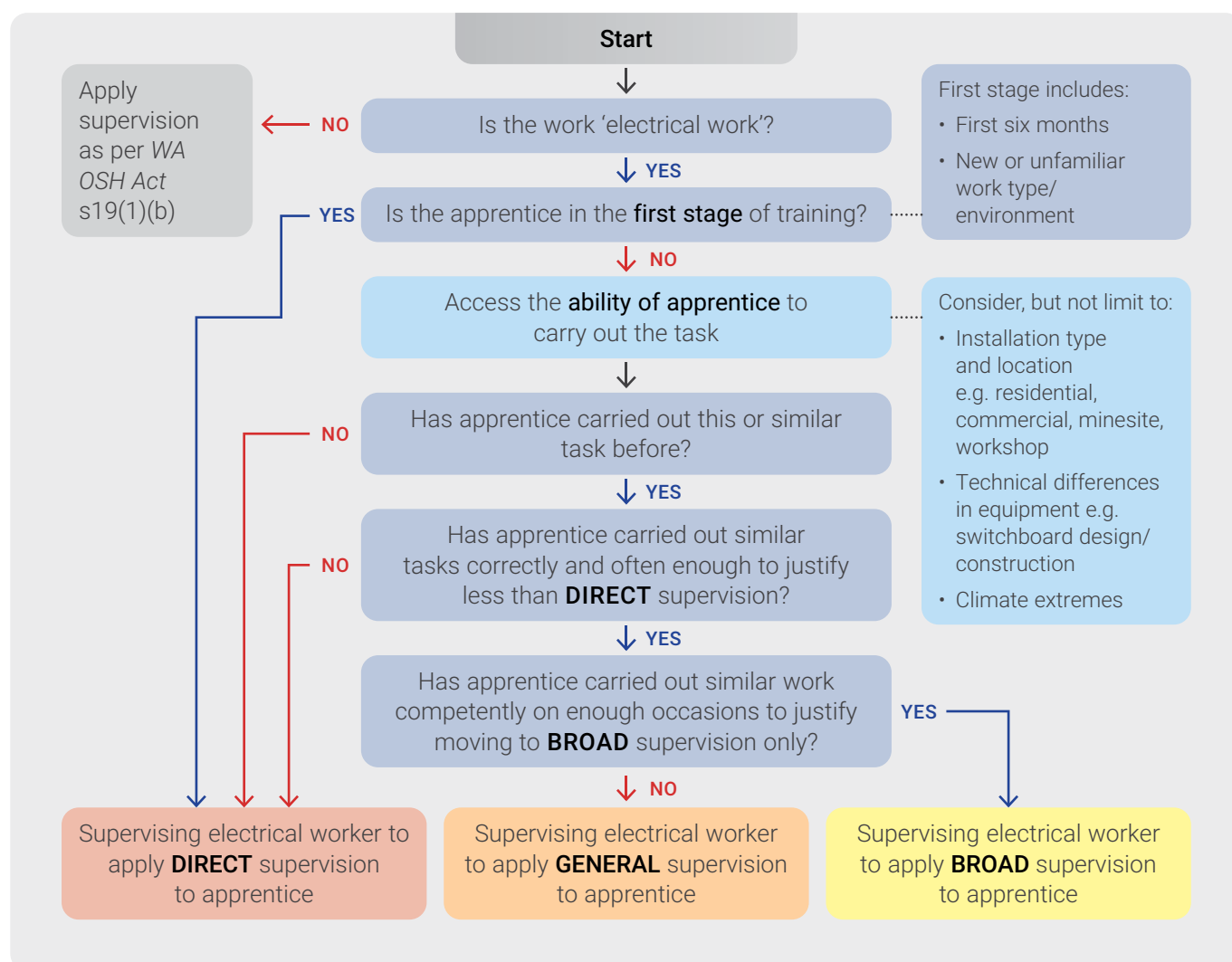


Figure 5: Adaptation of the levels of apprentice supervision

From the start of workplace training and prior to commencing work, apprentices should participate in the isolation and de-energisation procedure as follows:

- after observing that the supervising electrical worker has proven the circuit or equipment as de-energised and fitted their tags and locks, personally verify by electrical testing, that the circuit or equipment is de-energised (**TEST BEFORE YOU TOUCH**); and
- once proven as de-energised, follow the tag and lockout procedure and apply personal tags and locks.

Appendix 4 | Rescue and resuscitation

This information has been reproduced from the Australian Resuscitation Council Guideline 8 – Cardiopulmonary Resuscitation.

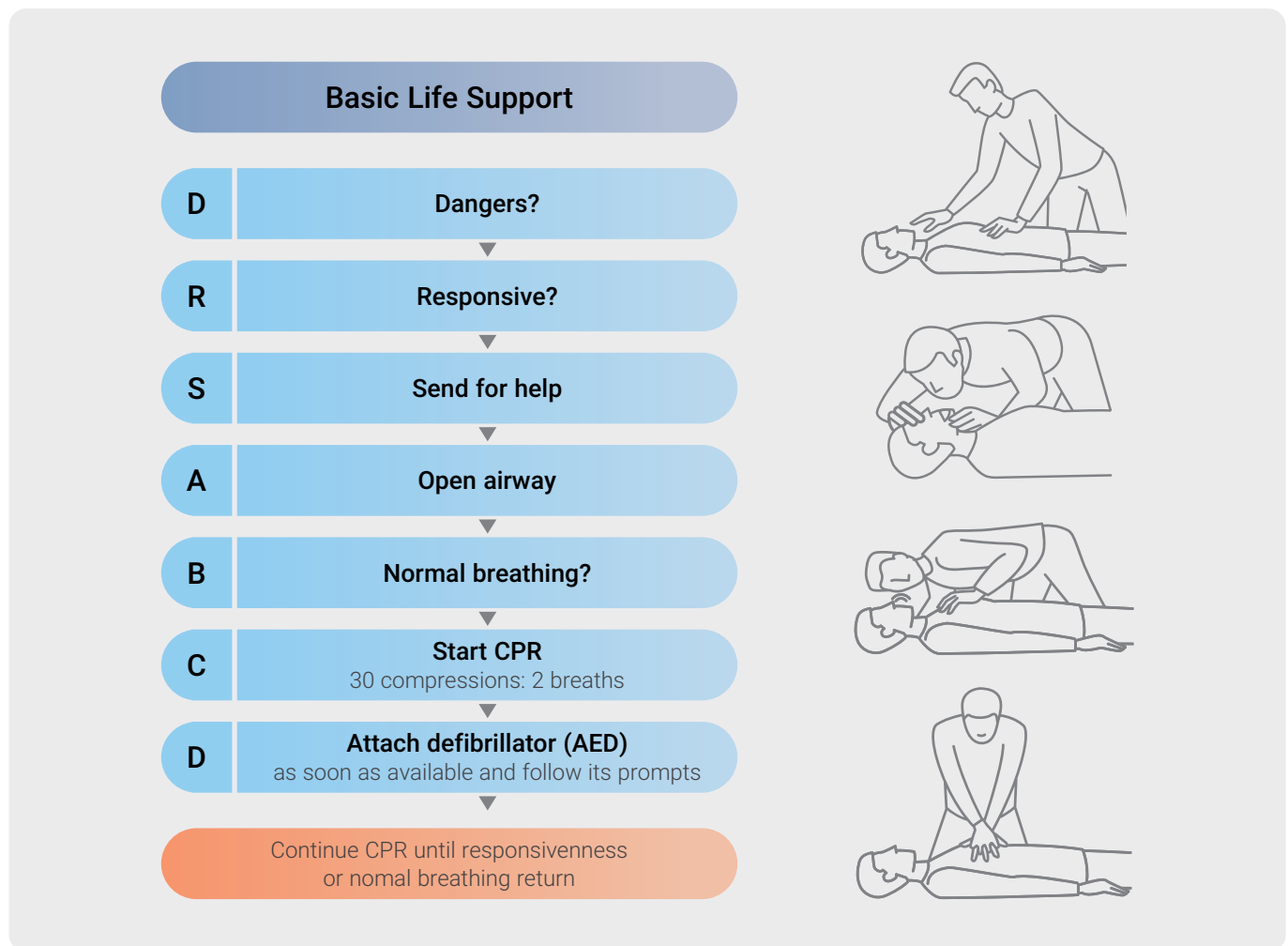


Figure 6: Recommended emergency life support procedures



**Feedback on any aspect of this document is encouraged.
Comments and suggestions may be sent to:**

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Locked Bag 100 East Perth WA 6892
Email: energysafety@demirs.wa.gov.au

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